American Machinist

JULY 28, 1958 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Cutting Fluids for Abrasive-belt Grinding

page 76

• **"Pigeon-hole parker" picks bodies for final assembly** — page 71

it's mainly a matter of TIMING!

Knowing WHEN to replace a machine saved one manufacturer $16,794 a year

TAKE ANY machine in your plant. You know that some day it will have to be replaced. But *when?* That is the big question. And wrong answers probably cost American Industry millions of dollars every year.

For any machine, there is one optimum replacement time—the time when it can be replaced with a new one at *lowest overall cost*. And it can't be determined by haphazard methods. Guesswork, intuition or rule-of-thumb computations will be wrong most of the time. And even some obsolescence formulas are not above suspicion. But you can put a dollar sign on every variable involved, and come up with a precise figure that will mean a major saving in production cost and capital investment.

Heald sales engineers are well experienced in making obsolescence studies to determine when a machine should be replaced. Sometimes it is found that replacement is overdue. And often it can be shown that next year or the year after would be better for the customer. If you would like help in planning your replacement program, or want to confirm your estimates for a particular machine, just call in your Heald engineer. Similar studies have pointed the way to many important savings.

For Example: A manufacturer of aircraft instruments had been using a 5-year-old precision lathe to perform boring, turning and facing operations on instrument cases. But when this was replaced with a new Heald Model 0 Unit-Type Bore-Matic like that shown at the right, operating costs for the same production were immediately reduced by over 78%. In addition, the elimination of a separate burring operation and reduced assembly time made further important savings, as indicated by the cost analysis below.

	Old Machine	New Machine
Parts per hour	4.3	20
Parts per year (Req'd. Prod.)	10,000	10,000
Direct and Indirect Labor, per year	$20,349	$ 6,055
Scrap Losses, per year	$ 500	$ 300
Annual Maintenance Cost	$ 600	$ 300
Annual Operating Cost	$21,449	$ 6,655
Basic Annual Saving, New Machine		$14,794
Additional Saving from elimination of separate operation		$ 500
Additional Saving from reduced assembly time		$ 1,500
Total Saving Per Year		**$16,794**
Return on Investment for New Machine		**84%**

YOU pay for obsolescence. Replacement pays for itself!

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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Which cutting fluid for abrasive-belt grinding? . . . Concrete test data answers this question and shows when to use which type of fluid. *By Dr Hugh N Dyer, Behr-Manning Co.* **76**

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Hotpoint streamlines bending and welding . . . Cooperation in design of product and design of equipment to produce it increased productivity and eliminated in-process inventories. *By Ray F Herman, Hotpoint Co.* **84**

Chop off the pieces when you can . . . A change in the form of raw material cut both material and processing costs at Wright Aeronautical. **88**

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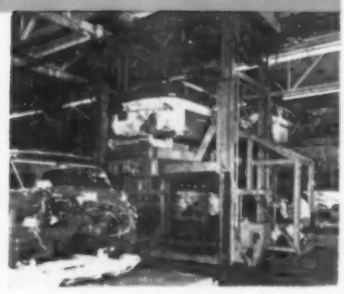
Quick solution of compound angles . . . A pair of tables that provide the answer, accurate to the nearest minute. *By D E Sweet.* **91**

Nomogram for punch length, I, II . . . A guide that should provide punch dimensions that will avoid breakage. *By Rudolph Gruenberg, Westinghouse Lamp Division.* **93**

American Machinist chips



The storage conveyors hold a total of 90 finished bodies at Mercury's new assembly plant at Rivera, Calif. The traveling elevator picks up bodies from any of the conveyor lines and delivers them to a turntable (foreground, on the cover) which rotates the body 90°. An overhead monorail then delivers the body to final assembly. The conveyor system was engineered by Link-Belt Co to a pattern developed by Ford. For other examples of material handling at this new plant, see the article on page 71.

One of the more remarkable changes in general metalworking practice in recent years has been the development of abrasive-belt grinding. It is used for a wide variety of applications on an equal variety of materials. As with conventional grinding, the fluids used may be critical. Dr Hugh Dyer at Behr-Manning has been conducting tests to determine the advantages and limitations of each type of fluid. You'll find the results summarized in his article on page 76.

Coordination of design and production keeps getting more emphasis. A recent example is the tub for a dishwasher. The part was redesigned with Hotpoint and Cyril Bath working together to develop the most effective set of press operations to handle the new part. R F Herman, manager of manufacturing engineering at Hotpoint, tells the story. See page 84.

Nomograms provide a way to pack more information into less space than anything else. In effect, they provide a graphic solution to a formula. In this issue you will find a valuable nomogram for thin round punches. For convenience it is in the Reference Book Sheet section, and for convenience this section is perforated for easy removal.

Readers' Service... Because more than half of you, the readers of *American Machinist*, read your copies at home, you sometimes have difficulty in getting more information about the things you read. Starting with this issue, you'll find a revised Readers' Service Card which makes it easy to ask for a catalog, for more information on new equipment described, or on products advertised. You'll find the card just inside the back cover.

Coming... *AM* for August 11 features a special report on power sources for arc welding, a practical application of operations research, and a collection of tooling articles.

Cover...

Traveling elevator removes bodies from any of ten storage lines and delivers them to final assembly. See details at left.

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How to eliminate *your* shaft distortion problems

Distortion during hardening is a major production problem.

The Gleason No. 140 Rolling Quench Machine corrects this difficulty, because the quenching and straightening operations are performed at the same time. Because cold straightening is eliminated, valuable production time and expense are saved, and the quenched parts have less residual stress.

Shafts cannot distort because they are rolled under pressure throughout the quenching operation. The operator puts the hot part on the lower rollers and starts the machine. From there on, the quenching operation is automatic. Rolling speed, pressure, and oil flow are pre-set to suit the work that is being quenched.

The automatic quenching cycle saves operator time, and gives *uniform* results for all parts quenched. The pre-set metallurgically correct oil flow gives uniform hardness.

The Gleason No. 140 Rolling Quench Machine is equally suited for small or large quantities. It accommodates shafts $\frac{9}{16}$" to 4" in diameter, 6" to 40" in length, with integral cams or shoulders up to 8" diameter. Tooling can be arranged to hold parts on diameters or centers. Unusual shapes can be handled with additional tooling. Write for further information.

The Gleason No. 140 Rolling Quench Machine also handles multiple quenching of short shafts.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

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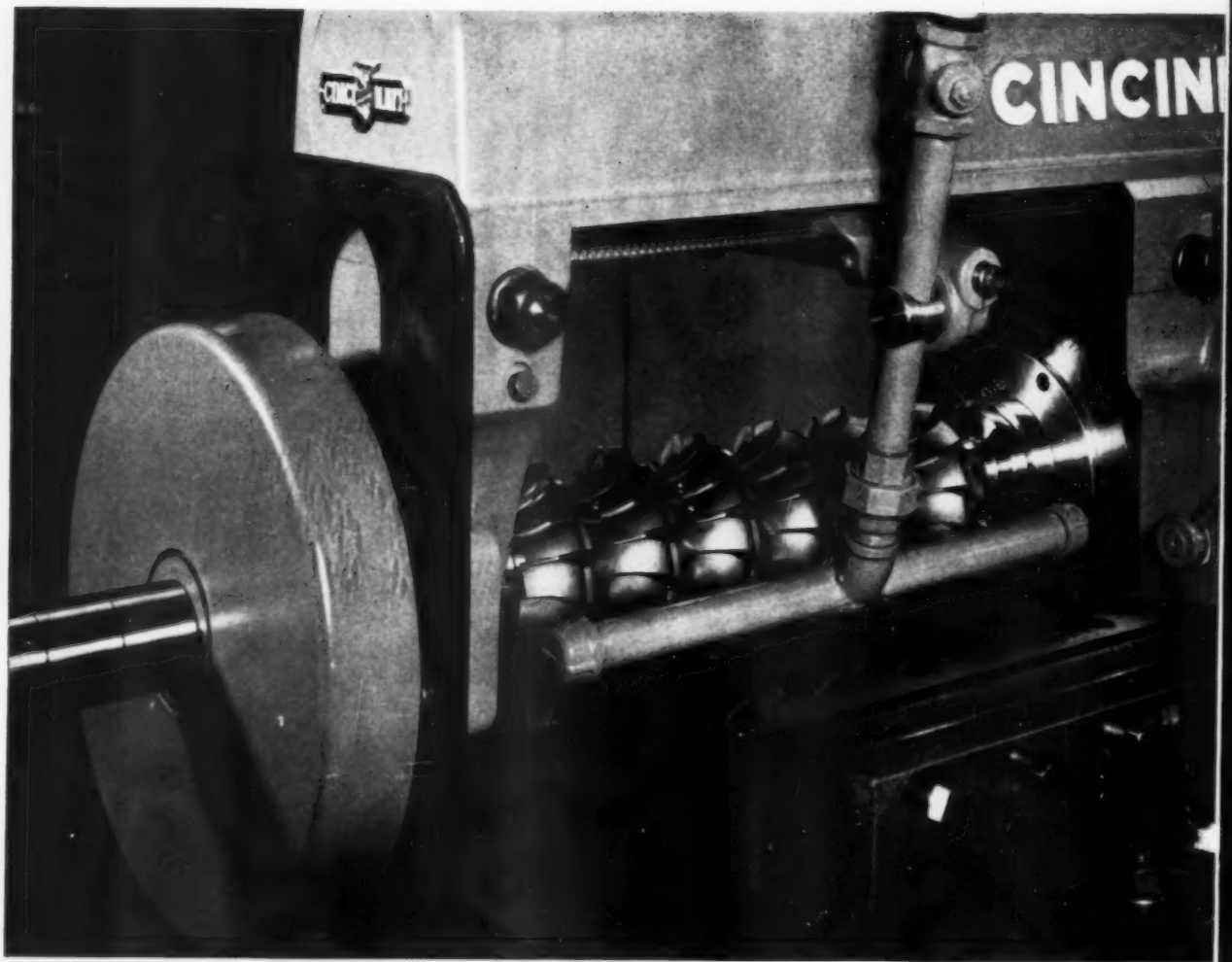
CINCINNATI



Large Woodruff keys, 80 per cycle, are the end product of this form milling operation on rectangular steel bars 18" long.

A string of Woodruff keys, all milled at the same time from rectangular steel bars. Color areas indicate stock removal.

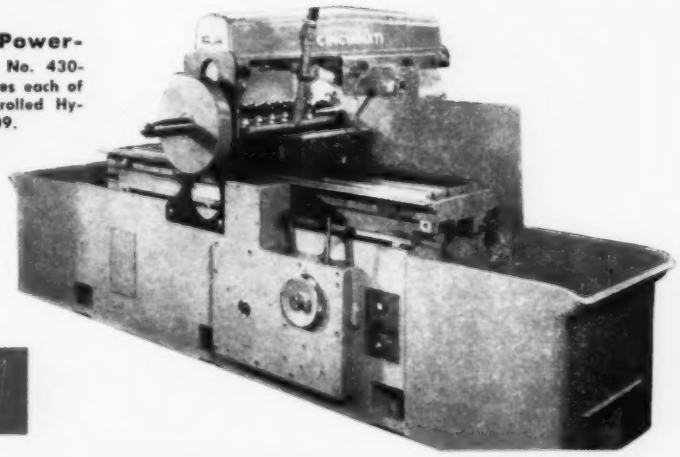
CINCINNATI® Knee Type Milling Machines • Bed Type Milling Machines

HyPowermatic

GANG FORM MILLS large keys from 18" long blank

Gang milling is a commonplace timesaver. But there's more than the usual assembly of cutters in the setup illustrated here. Just consider these tough requirements: the parts are form milled, five at a time; they present very little clamping surface; depth of cut varies up to 1" at the cut-off point between parts. This certainly is not a commonplace job, but the CINCINNATI 30 hp Plain HyPowermatic performing the milling operation gives it a routine, low-cost status. ¶ The parts are Woodruff keys. They are milled from solid bar stock, several pieces of which are clamped in the fixture. Rugged construction of the HyPowermatic, plus Cincinnati's exclusive Hydra-mech table drive, take care of the heavy metal removal requirements. Down milling, a standard operation for these machines, prevents the work from pulling out of the fixture. Eighty keys are obtained per cycle. ¶ CINCINNATI HyPowermatic Milling Machines offer many advantages for production milling operations within 10 to 50 hp classification. In addition to the many fine standard features, two of which are noted above, you can reduce special machine investment through Cincinnati's unit construction plan. Combinations of units obtainable include close-coupled spindle carriers, vertical and angular spindle heads, and others. Get the complete HyPowermatic story by asking for catalog No. M-1909. Brief specifications in Sweet's Machine Tool File.

CINCINNATI Plain HyPowermatic Milling Machine. No. 430-184 illustrated. There are 42 sizes each of Plain, Duplex, and Tracer Controlled HyPowermatics. Catalog No. M-1909.



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Die Sinking Machines • Cutter and Tool Grinders

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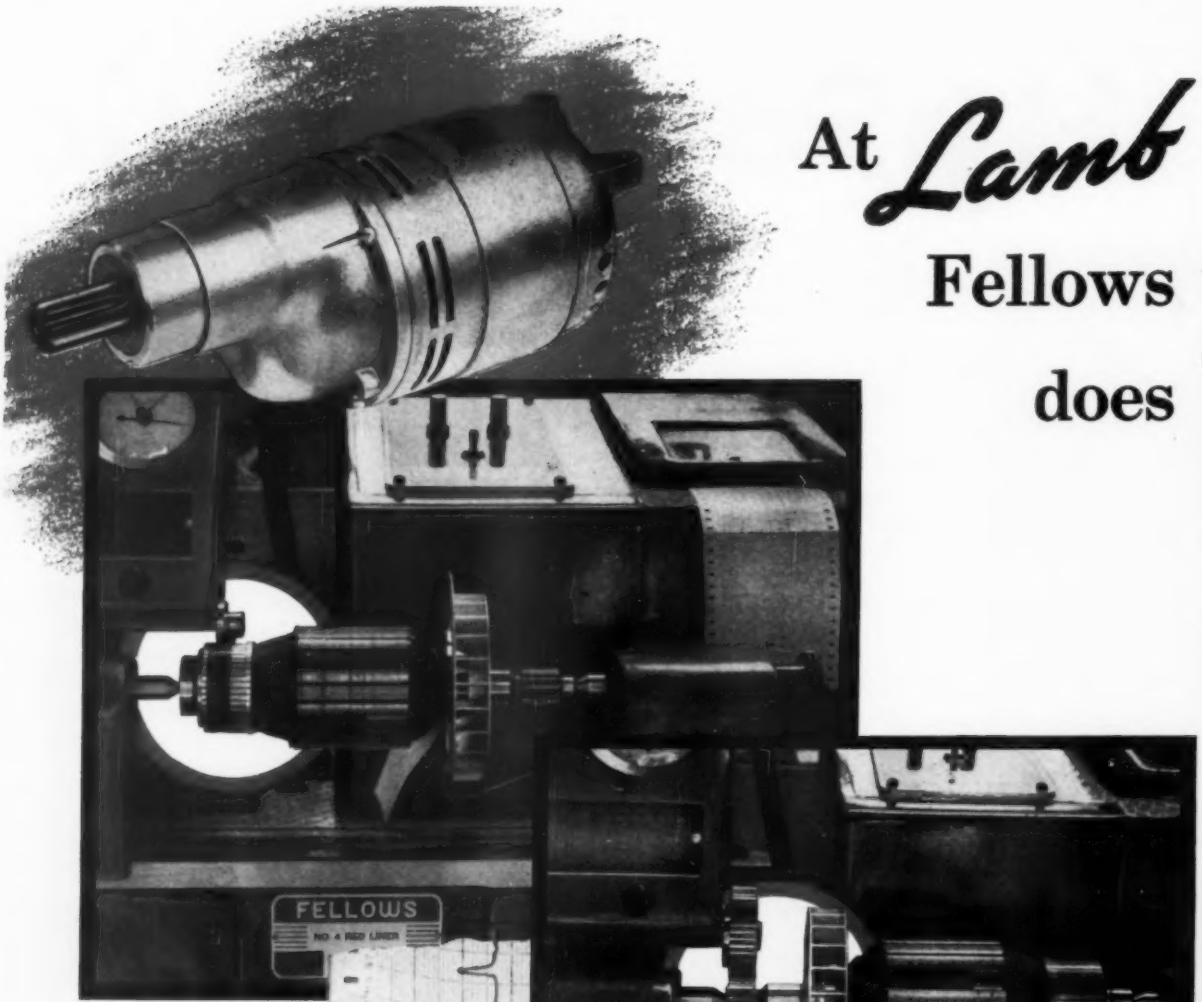
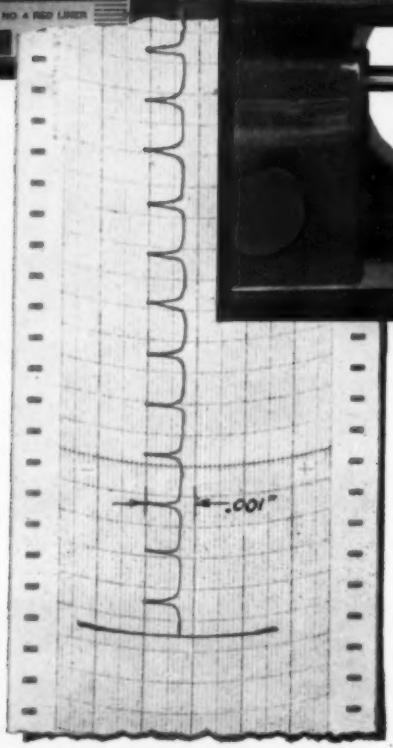
At *Lamb* Fellows does



● *After 20,000 rpm test run, motor commutator is inspected on Red Liner. Permanent chart (at right) shows segment concentricity and spacing.*



● *Gear is given composite check quickly and simply, using master gear on the same Red Liner.*

THE PRECISION LINE

Electric

Inspection Instrument

DOUBLE DUTY!

Here's an example of a gear inspection instrument that's also proved ideal for other inspection uses! At the Lamb Electric Company, Kent, Ohio, a standard Fellows No. 4 Fine Pitch Red Liner checks pinions for high speed gear-motors... and inspects the motor commutators too.

When checking commutators for concentricity and spacing of segments, Lamb Electric substitute a ground disk on the master spindle for the master gear ordinarily used. Inspection is fast and accurate. Commutators are checked after baking and after each high speed test. The permanent chart made by the Red Liner permits easy comparison of successive test results.

The low output speed, high torque gear-motors manufactured by Lamb Electric demand precision in every detail. Gears are produced on a Fellows 3" Fine Pitch Gear Shaper and inspected on one of four Fellows inspection instruments, with consistently excellent results in production speed and accuracy.

For full information about the complete Precision Line of Fellows gear production equipment, get in touch with your Fellows representative. Contact any Fellows office.

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Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich.
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Fellows No. 4 Fine-Pitch Red Liner

Fellows *Gear Production Equipment*

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Dependability, increased payload, and improved performance . . . these are the outstanding features of the new Sikorsky S-58 commercial helicopter for transport service.

And you can say the same things about Morse *Electrolized* Tools, used in construction of the S-58. *Dependability* on the toughest jobs. *Increased payload* . . . because Morse *Electrolized* Tools last up to 100% longer. *Improved performance* . . . because every hole is smoothly and accurately drilled.

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means "THE MOST" in Cutting Tools

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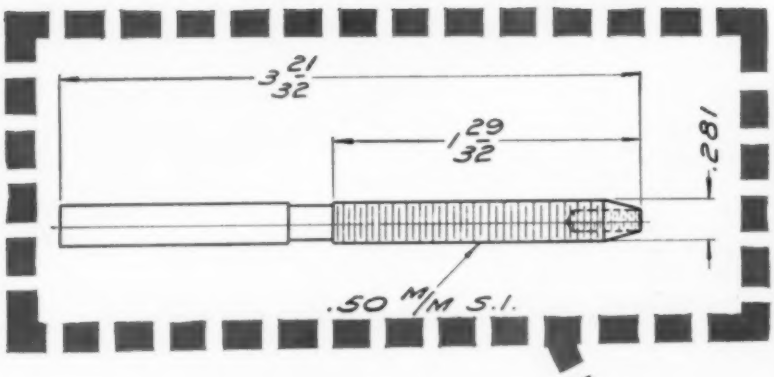
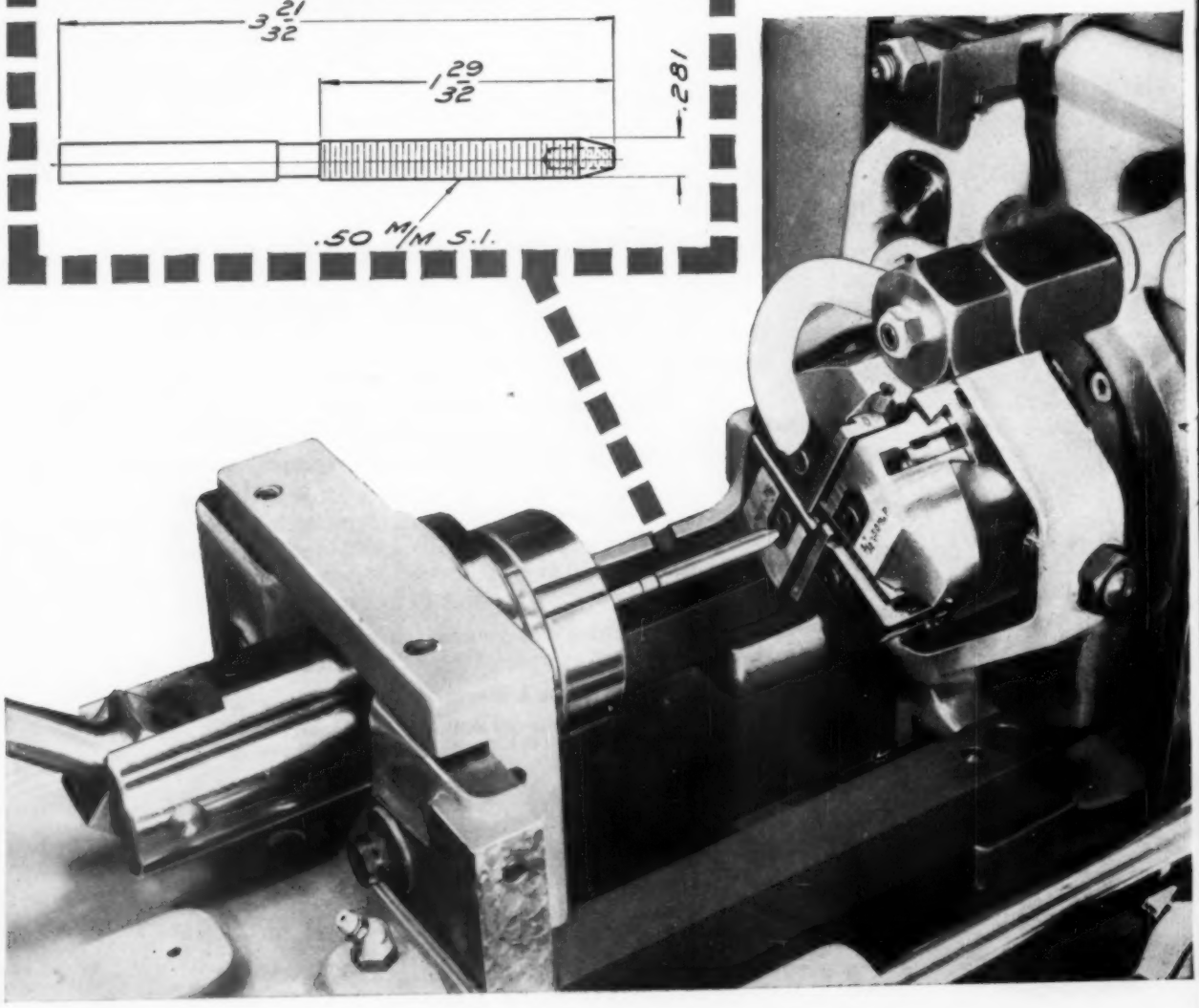




SPEED machine

for small diameter precision threading

The 5C LANDMACO Lead Screw Machine is illustrated threading micrometer spindles at high speed to close tolerances at the Blanchard Engineering and Electric Company, Chicago, Illinois.

SPECIFICATIONS:

Workpiece Material	Stress-proof steel (C1144) cold-drawn, strain-relieved, 260 to 280 Br.
Thread Specifications:	
Diameter	.281"
Length	1-29/32"
Type	.50 M/M System International
Tolerance:	.2683-.2688" P.D., absolute concentricity and lead required.
Production:	195 per hour
Tool Life:	625 pieces—average between chaser grinds

The 5C (5/8") LANDMACO Machine is a compactly-designed small machine for precision threading of parts ranging from #4 to 5/8" in diameter. A 5VVV LANCO Hardened and Ground Head is furnished as standard equipment to assure maximum accuracy—lead screw feed is optional. The die head is equipped with LANDIS Tangential Chasers which provide long life between grinds and can be reground for 80% of their original length.

8 spindle speeds ranging from 150 to 1000 RPM, automatic opening and closing of the die head, a hammer-blow handwheel to intensify vise gripping power, and carriage travel by means of a convenient operating lever are all features designed for operating ease and production efficiency. Air-operated carriage front and air-operated carriage return are available as extra equipment. In addition, there are a variety of special carriage fronts, such as the lever-operated collet front shown, for holding difficult-to-grip workpieces.

LANDMACO Machines are manufactured in models for threading all diameters from #4 to 6 5/8". Send us specifications of your workpiece . . . let us show you how a LANDMACO Machine will handle your threading operation efficiently and economically.

496C

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA

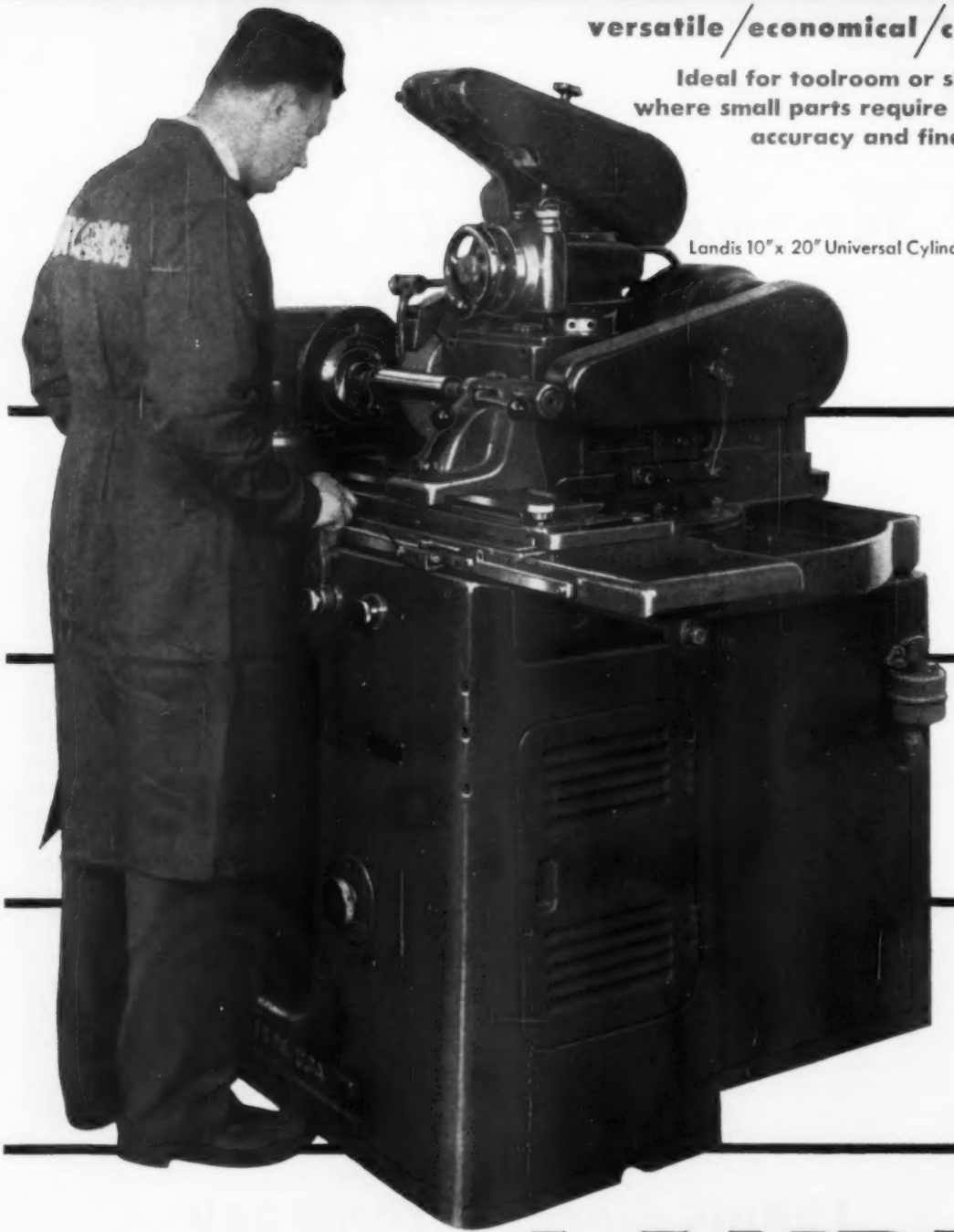
the world's largest manufacturer of threading equipment CUTTING • GRINDING • ROLLING • TAPPING

CIRCLE 205 READER SERVICE CARD

Savings in setup and operating time

versatile / economical / compact

Ideal for toolroom or short runs where small parts require precision accuracy and fine finishes



Landis 10" x 20" Universal Cylindrical Grinder

LANDIS

precision grinders

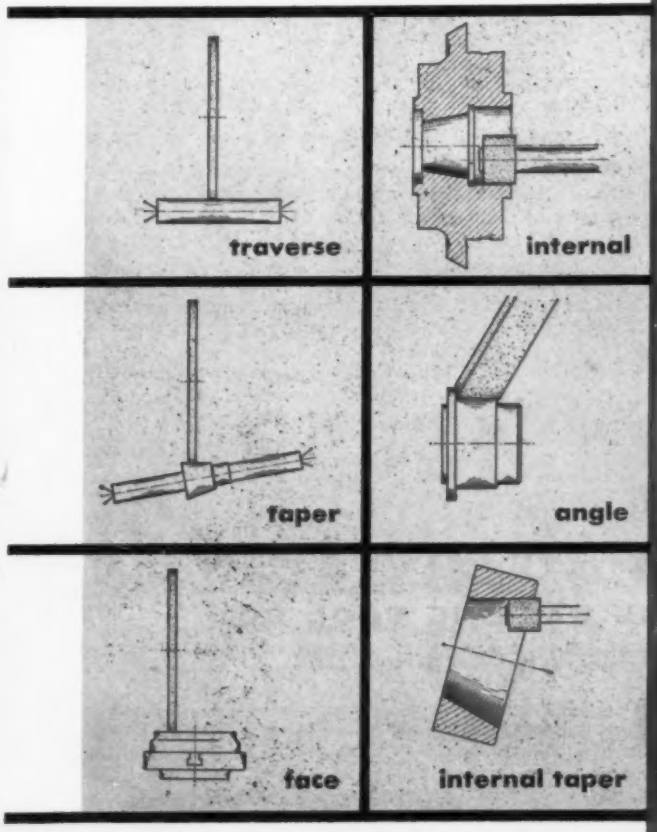
lower grinding costs on small parts

Eye level wheel feed for fast setup and operation

condensed specifications

Maximum work swing	10¾"
Length between centers	20"
Diam. standard grinding wheel	10"
Wheel drive motor	1 hp.
Work speed range	90 to 600 r.p.m.
Net weight, including elec. equip.	4100 lbs.

grinding operations on the 10" x 20" universal



Internal grinding with modern swing-back fixture

Controls grouped for easy setup and operation.

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

CIRCLE 206 READER SERVICE CARD

The big 3 inch

G&L 300-T table-type horizontal boring, drilling and milling machine

Here's America's most versatile 3" dia. spindle horizontal machine! With truly exceptional efficiency it bores, mills, drills or taps. Generous bearing surfaces provide maximum rigidity to give the 300-T outstanding ability to consistently produce excellent finishes with precision accuracy *through the entire machining range.* For further facts, call your nearest G&L representative or write direct.

FEATURES THAT CAN PRODUCE MORE PROFIT FOR YOUR SHOP:

- **45 spindle speeds, 36 spindle feeds** provide exact choice for any type tooling or work material.
- **Full length precision scales and verniers** easily read to .001" for headstock, table, saddle and end support.
- **Hardened bed and saddle ways** provide longer life to maintain higher machining accuracy.
- **Rotary selectors and rotary reading dials** for fast, accurate selection of feeds and speeds.
- **23 milling feeds.** Ideal for a broad variety of milling.
- **Independent operation;** all units operate independently in either direction, simplifying machine handling and control.
- **Automatic electric positioning device** accurately controls distances between machined holes. Makes possible positive machine settings for boring operations repetitive to .0002". Ends pre-layout and manual adjustments. (*)
- **Improved measuring device** for headstock, table and saddle provides extreme accuracy in positioning with readings to .0001". (*)
- **Exclusive G&L "Lubri-Cool" system** assures accurate operation under any temperature condition. (*)

(*) Optional equipment

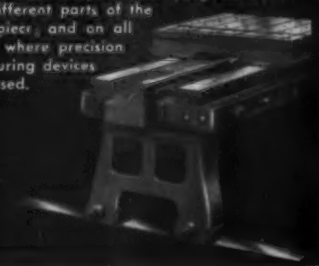
G&L *and* HYPRO DIVISION

GIDDINGS & LEWIS MACHINE TOOL CO.

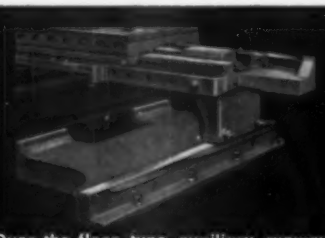
FOND DU LAC, WISCONSIN

G-94

Builders of the world's finest heavy-duty Table, Floor and Planer Types Horizontal Boring, Drilling and Milling Machines; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring and Turning Mills; Spar and Skin Milling Machines; VARIAX Milling Machines and NUMERICORD-numerical continuous path tape controls.



Saddle supports and auxiliary runways recommended for greatest accuracy where operations are performed progressively on different parts of the workpiece, and on all work where precision measuring devices are used.



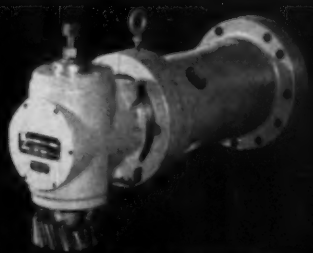
Over-the-floor type auxiliary runways provide complete location flexibility. Especially designed to meet problems created by foundation limitations.

Built-in rotary tables eliminate multiple work setups. Two sizes: 30" x 36" and 36" x 42"

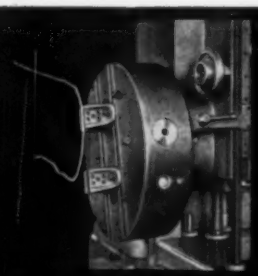
FAST, ACCURATE, VERSATILE, PRODUCTIVE

G&L Model 300-T table-type Horizontal with automatic electric positioning device completes 47 distinct operations in less than three hours on this complex gear case housing. It bores, drills, mills, counterbores and reams. The 300 Series machines are available in two models with a wide range of specifications: Standard Model 300-T and Model 300-RT machine with a built-in rotary table.

Combination plain, hand and power feed rotary table — fast, accurate hand or power indexing. Available with round, square or rectangular platens in various sizes.

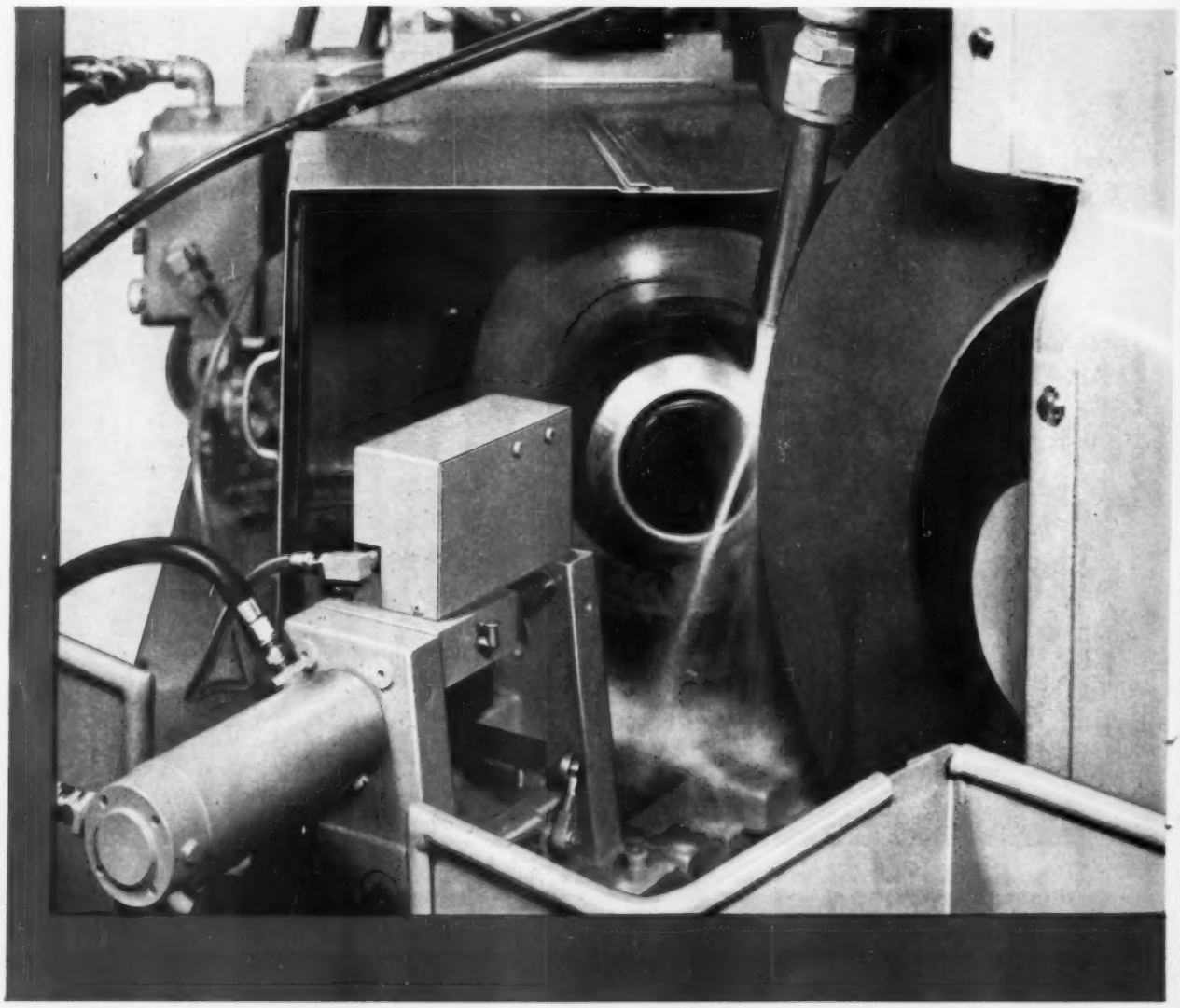


Angular milling attachment operates at right angles to machine spindle. Unusual flexibility for machining hard-to-reach surfaces.



Continuous feed facing and boring heads used separately or in combination with other attachments or accessories for turning, facing, threading, back facing, grooving, etc. Telescopic right angle and facing tool holders, and high speed grinder are also available.

Family of hard-faced



Finish grinding radius and seats of hard-faced valve cores. Automatic air-electric gage sizing unit in foreground.

CINCINNATI®

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING
ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES •

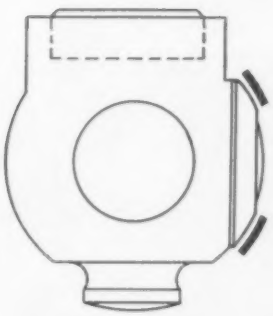
valve cores

. . . automatically ground and sized on CINCINNATI FILMATIC *Chucking Grinder*

Hard-facing the seats of valve cores greatly extends the life of oil industry valves. But, after the hard-facing operation, accurate, low-cost grinding becomes a problem. Cincinnati Grinding Specialists helped one prominent manufacturer find the solution. The machine selected for the job is a CINCINNATI FILMATIC No. 2 Chucking Grinder, tooled up to gain the advantages of completely automatic cycles despite low rates of production. ¶ There are 13 sizes of cores. A power chuck with interchangeable jaws accommodates the complete range. The headstock automatically shuttles from grinding position to loading position, synchronized with the automatic cycle which includes Cincinnati's exclusive Gap Eliminator (reduces time spent in "grinding air"), automatic air-electric gage sizing, automatic wheel balancing, and automatic profile truing.

Stock removal is very high; as much as .150". To assure the finest quality of finish, the wheel is automatically trued just before the last .005" stock is ground away.

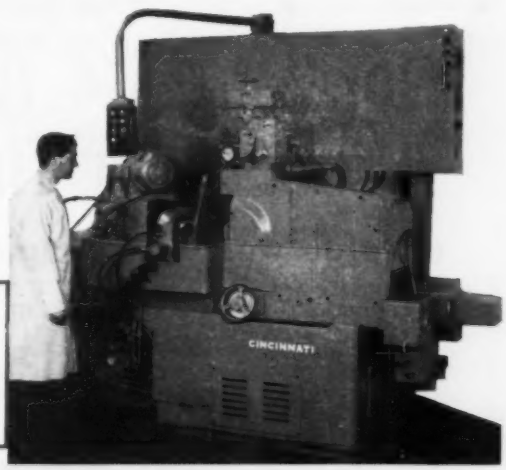
This equipment is indicative of Cincinnati's advanced thinking in supplying precision grinding machines completely tooled up to meet the production and cost requirements for new products or to correct the cost disadvantage of using outdated equipment. Our Specialists want to help you, too. Ask for a visit by one of our field men.



Drawing of one of 13 sizes of valve cores. Heavy line indicates ground diameter.

Production data:

Operation	grind radius on seat
Material	Stelite hard-facing
Production	20 to 35 per hour, depending upon size

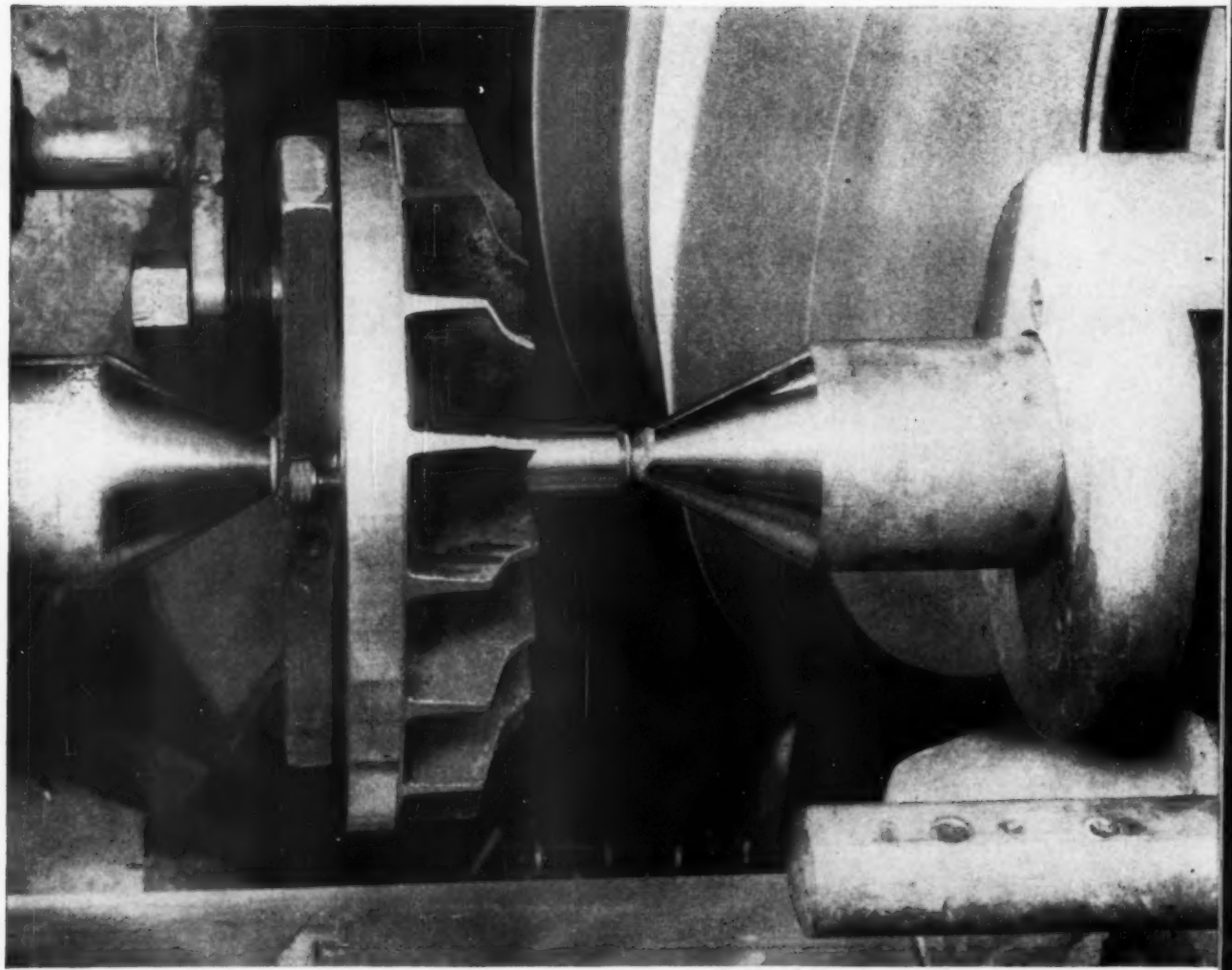


FILMATIC

CINCINNATI FILMATIC No. 2 Chucking Grinder, completely tooled up for low-cost production. Standard machine catalog No. G-685.

MACHINES • MICRO-CENTRIC GRINDING MACHINES
CHUCKING GRINDERS • CENTERLESS LAPPING MACHINES

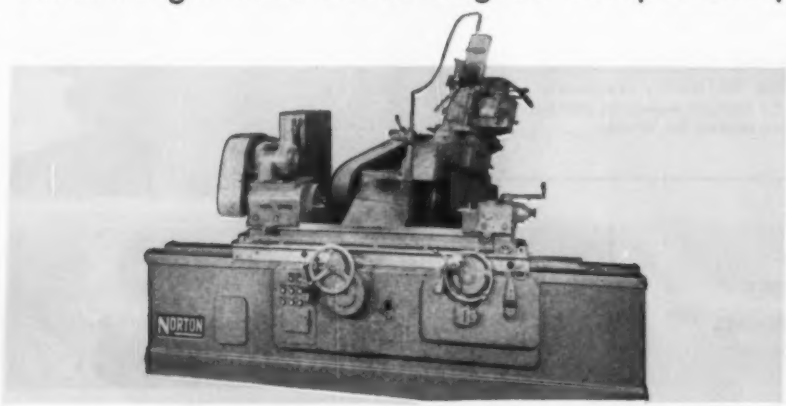
Grinding Machine Division
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



Norton CV-4 Grinder Cuts Production Time in Half

...at large west coast engine component plant

Saves on Grinding Operations



One Operation Does It! A Norton Type CV-4 10" Semiautomatic Angular Wheelslide Grinder was installed by the AiResearch Industrial Division of the Garrett Corporation to precision grind diesel engine turbocharger turbine wheels to increments as fine as .0005". Previous grinders performed 4 separate grinding operations. The Norton CV-4 increased efficiency and reduced grinding to a single operation. As a result, production time dropped from 19½ to 8½ minutes, for each turbocharger . . . a 56% reduction!

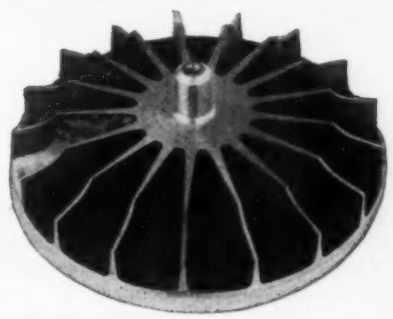
"Norton Type CV-4 Semiautomatic Angular Wheelslide Grinders combine shoulder and diameter grinding to give big operation economy."

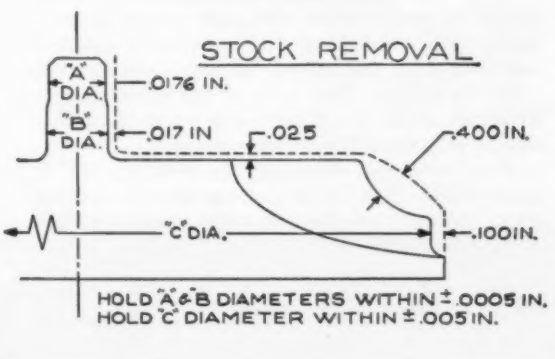
Combining several precision grinding jobs and doing them faster and better is routine performance for this cylindrical grinder. For example, it leaves a concentric grain pattern on shoulders, improving the sealing quality and appearance. The CV-4 gives the "Touch of Gold" to your production by reducing effort, time and costs, and increasing your grinding profits.

- Automatic grinding cycle saves operator's time and effort and makes possible his tending more than one machine. Once the cycle starting lever is pulled the machine takes over and automatically grinds to size.
- Automatic wheel head mounted truing device provides pushbutton control of straight, stepped or formed wheel truing—eliminates need of skill and reduces wheel cost per piece ground.
- Ramped outlet from coolant tank speeds clean-out . . . pumps and motors all outside and easy to reach . . . electrical controls all grouped in raised enclosure . . . base ways protected by steel tape guards, requiring no additional floor space . . . hydraulic oil and ways lubricant carried in outside reservoirs with large gauge-glasses.

Type CV-4's can do the work of two or more ordinary cylindrical grinders in your plant. They are available with hand table or hydraulic power table traverse in 10″ and 14″ sizes, and in work lengths of 18″, 36″, 48″ or 72″. *Improve your competitive position and increase your grinding profits* — replace obsolete grinding equipment with these modern machines. Ask your Norton Representative for Catalog No. 1658-2, or write us direct. Remember, only Norton offers you such long experience in both grinding machines and grinding wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. In Canada: J. H. Ryder Machinery Co. Ltd., Toronto 5.

Set-And-Forget Automatic Operation Saves Labor . . . requires minimum of manual operation . . . loading, locating, starting cycle and unloading. Thus valuable labor is released for other work, yet precision is automatically maintained. For stock removal see diagram below.





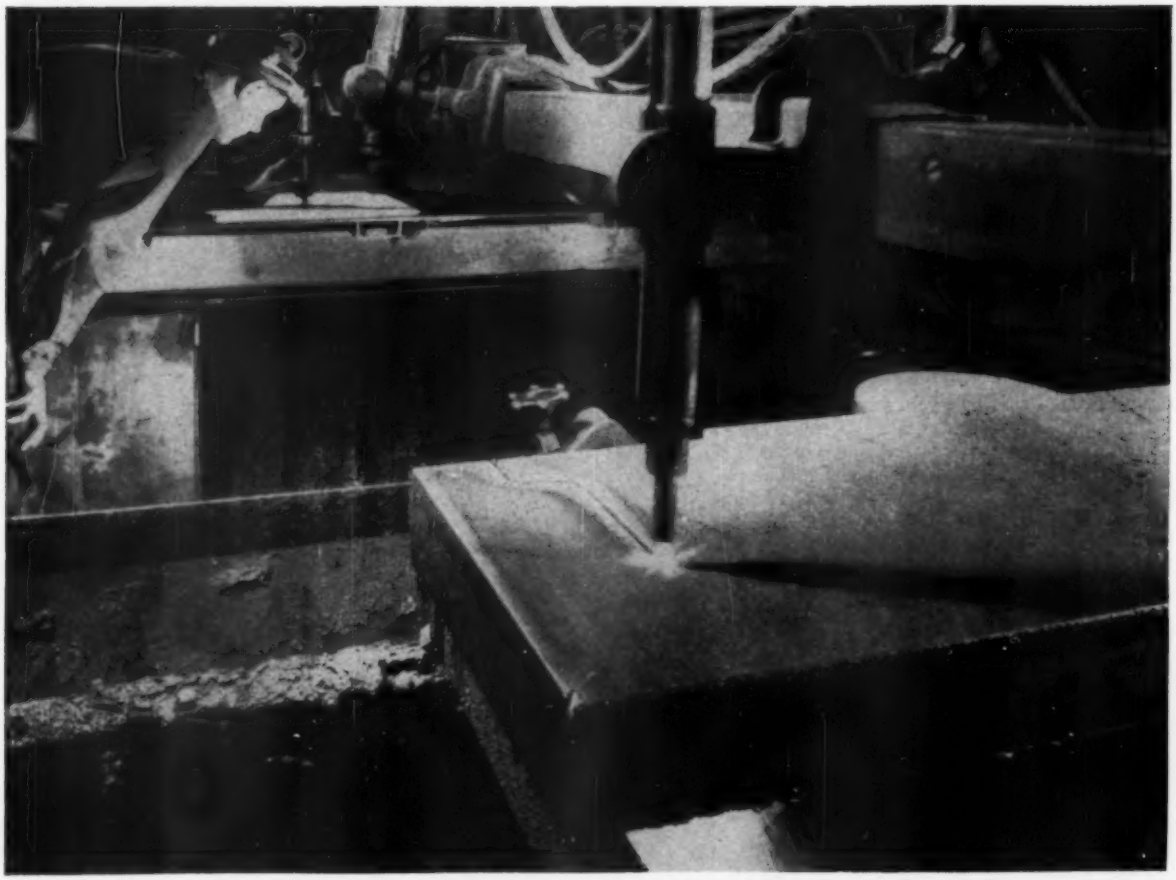
To Economize, Modernize with **NEW**

NORTON

GRINDERS and LAPPERS

Making better products...to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — **BEBR-MANNING DIVISION** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes



USS "T-1" Steel can be flame-cut, welded, formed, sheared, punched, machined or forged.

How to **beef-up** your equipment without adding fat

Build it stronger, tougher and lighter with USS* "T-1" Steel. This remarkable steel was developed especially to meet the needs for bigger tools, stronger equipment, larger yet less massive structures.

USS "T-1"* Steel is a low carbon, quenched and tempered constructional alloy steel combining weldability and formability with exceptional strength and toughness. Because of its high yield strength (100,000 psi minimum) you can cut weight safely—in actual applications, as much as 25% to 50% weight reductions have been achieved.

Total costs can frequently be reduced, too. In applications such as heavy machinery, rotating parts, pressure vessels and bridge members, steel costs can be lowered by reduction in cross section and substantial savings experienced in welding, maintenance, freight and erection costs.

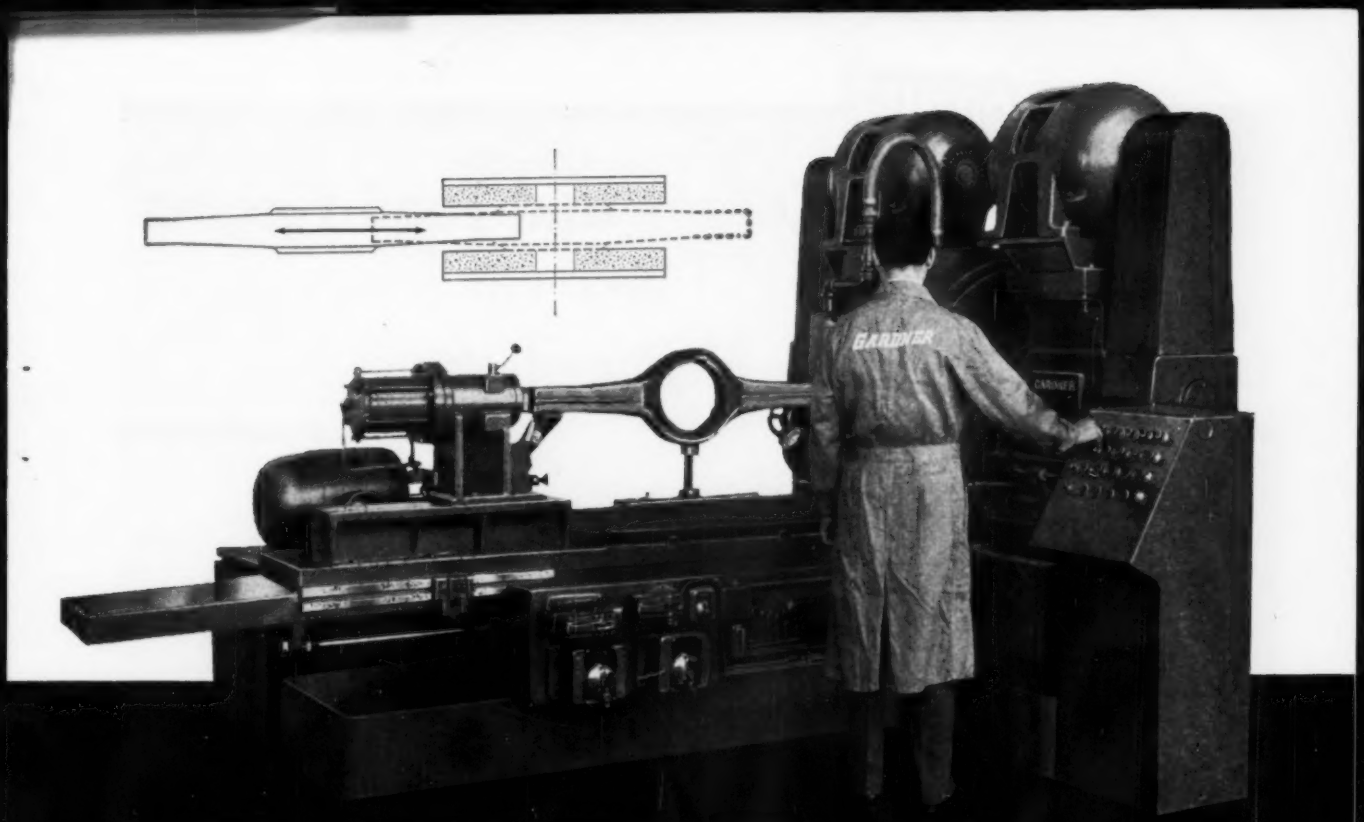
Also, in equipment subjected to impact abrasion, USS "T-1" Steel pays off. Users report service life increases ranging from 25% to 100%—or more. Power shovel buckets, bulldozer blades, coal and ore bins . . . all cost less in the end when made of "T-1" Steel because they last longer, cost less to maintain.

Write for free book. The many advantages, applications and cost-saving features of this versatile steel are completely described in our book USS "T-1." United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

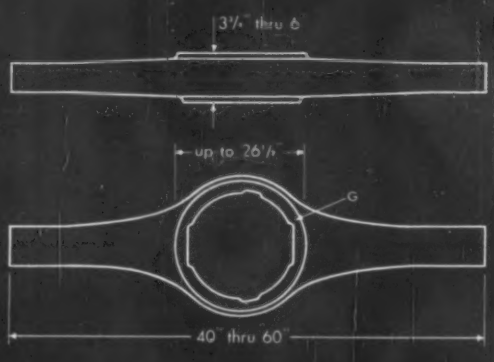
United States Steel Corporation – Pittsburgh
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Steel Service Centers
United States Steel Export Company

USS United States Steel

*TRADEMARK



Disc grinds two sides of large axle housing in one operation



Special fixturing reduces cost over one side at a time grinding

tooling

hydraulic sliding work table
air-clamping fixture
hydraulic head feed for face cutting
automatic lubrication
fixture mounted dressers

production data

Part:	axle housing
Operation:	grinding banjo section
Rate:	48 pieces per hour
Stock Removal:	½" to 1/16"
Disc Size:	36" x 3" x 20"

GARDNER

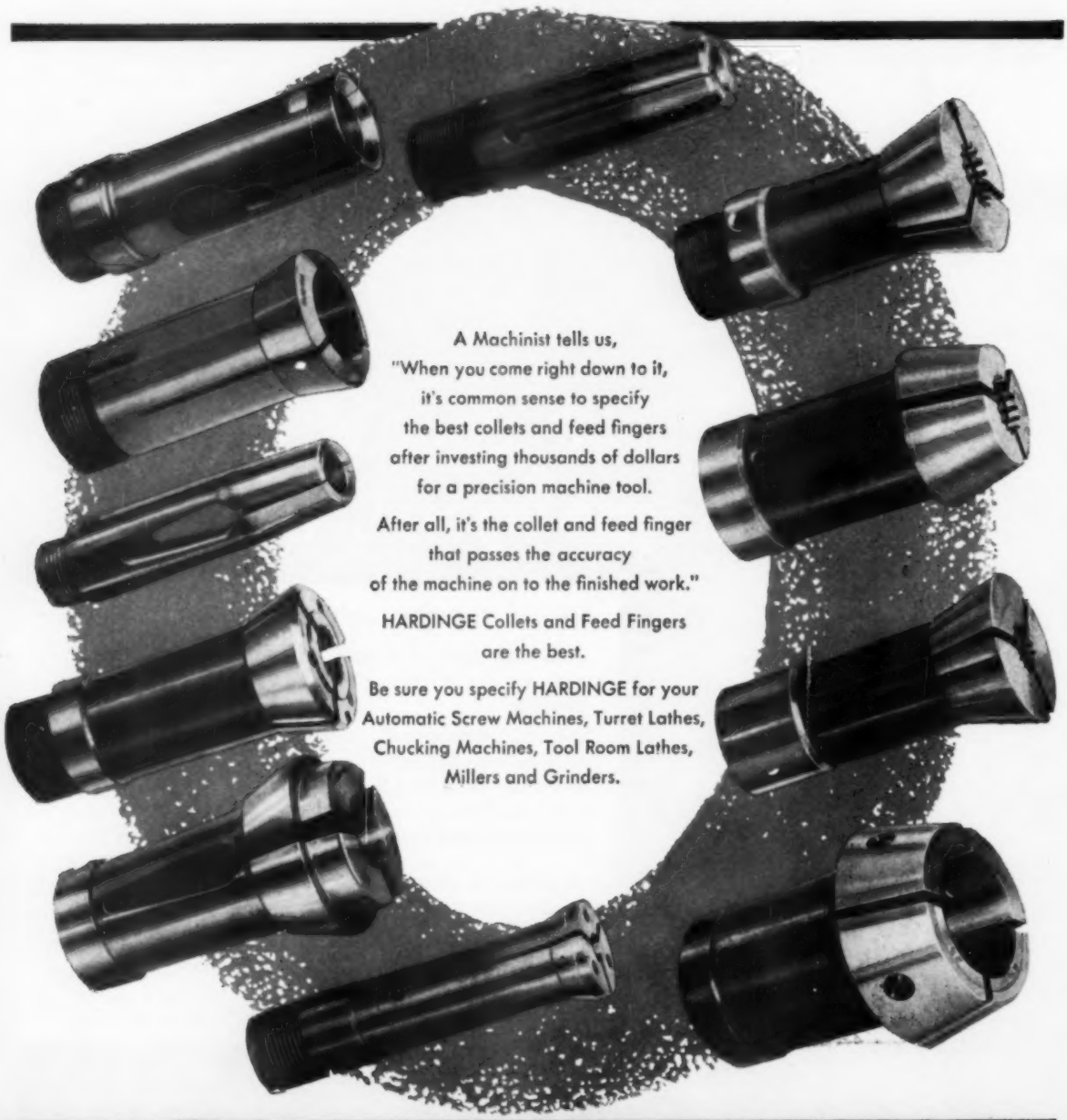
precision disc grinders

BELOIT, WISCONSIN

Specify HARDINGE ELMIRA, N.Y.

Collets and Feed Fingers

and *Get the MOST from your Investment in Machine Tools*

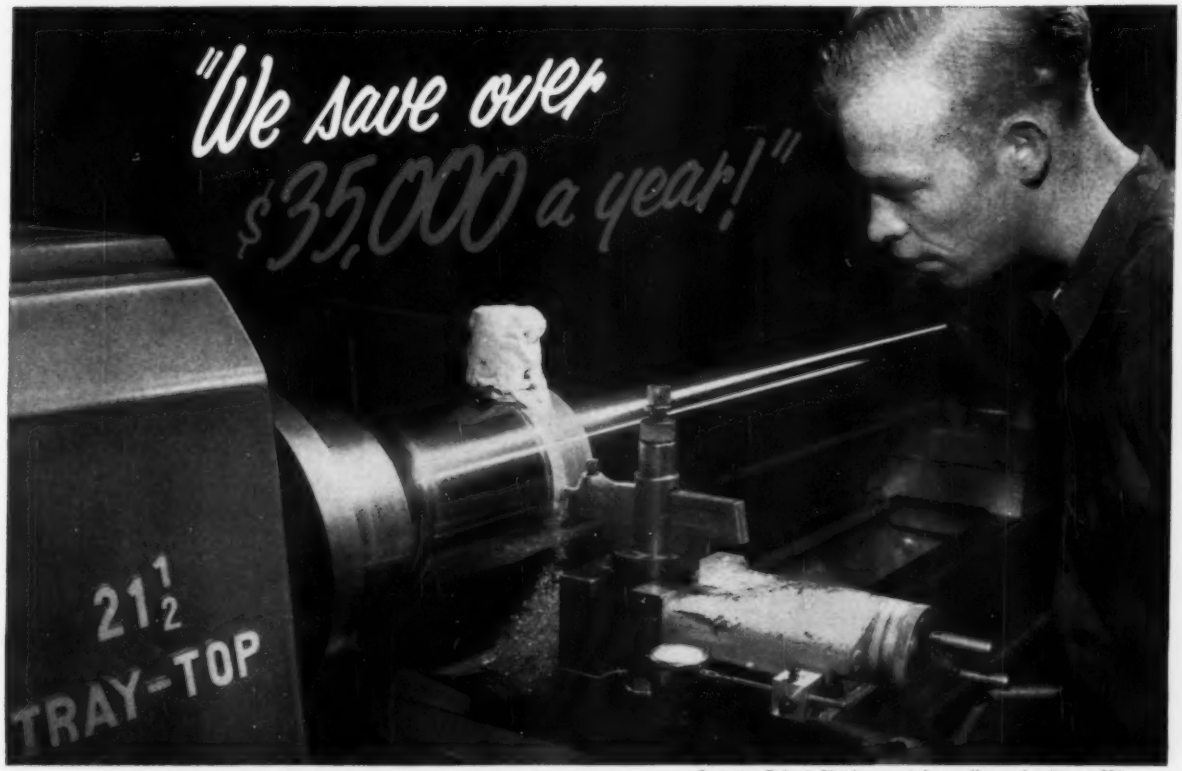


A Machinist tells us,
"When you come right down to it,
it's common sense to specify
the best collets and feed fingers
after investing thousands of dollars
for a precision machine tool.
After all, it's the collet and feed finger
that passes the accuracy
of the machine on to the finished work."
HARDINGE Collets and Feed Fingers
are the best.
Be sure you specify HARDINGE for your
Automatic Screw Machines, Turret Lathes,
Chucking Machines, Tool Room Lathes,
Millers and Grinders.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Immediate stock delivery from Elmira, Boston, Atlanta, New York, Hartford, Philadelphia, Rochester, N. Y., Dayton, Detroit, Minneapolis, Chicago, St. Louis, Oakland, Los Angeles, Toronto, Montreal



Operator Robert Oberhausen takes a diamond cut on a 48" long gravure printing cylinder at Southern Gravure Service.

OLD METHOD

Semifinish turn in multiple passes on a lathe.

•

Four separate polishing stages on a converted grinder.

NEW METHOD

First turn on Tray-Top with carbide cutter—second with diamond tool (each pass held within 0.0002" tolerance).

•

One final polishing operation to produce the required 2 microinch finish.

CINCINNATI "Tray-Top" Precision Eliminates 3 Polishing Stages on Printing Rolls

Southern Gravure Service, Inc., Louisville, wanted to hold 0.0005" tolerance in 60" of turning on printing cylinders. Both the 21½" and the 18" Tray-Top which they tried on the job consistently are holding 0.0002" on cylinders ranging from 4" to 14" in diameter, up to 75" long, and weighing from 250 to 500 lbs.

"Ability of these standard CINCINNATI lathes to hold such close tolerance *without modification* has eliminated need for three grinding operations," states John Schaefer, Southern Gravure's mechanical engineer. He estimates total savings at better than $35,000 per year.

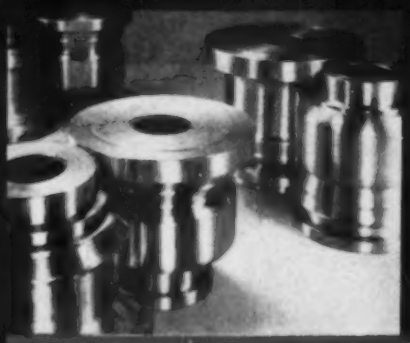
The "extra-sturdiness" of lathe bed, carriage and tailstock that is so vital to precision performance like this is only one of the many *features built into every CINCINNATI Lathe.* Why not talk it over with your CL&T Dealer and get economy-priced Tray-Tops into your profit picture!

Improved Machining Through Research

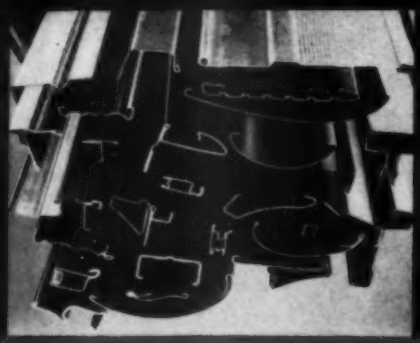
CINCINNATI LATHE AND TOOL CO.

3207 Disney Street • Cincinnati 9, Ohio

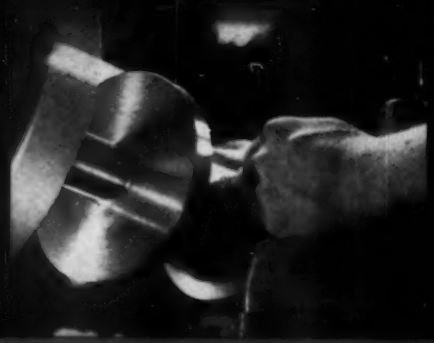
"TRAY-TOP" Lathes / "CINCINNATI" Drilling Machines / "SPIROPOINT" Drill Sharpeners



▶ Turning 3 to 20-stage rolls that . . .



▶ form automotive trim-molding is . . .



▶ a one-of-a-kind job of craftsmanship . . .

▶ checked . . .

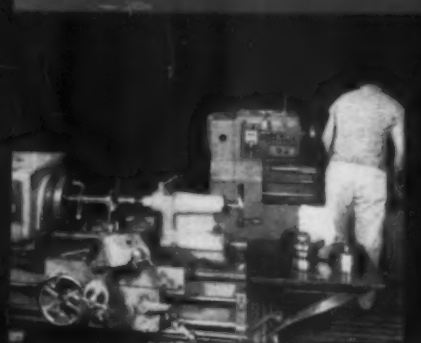
▶ rescraped . . .

▶ and checked again . . .

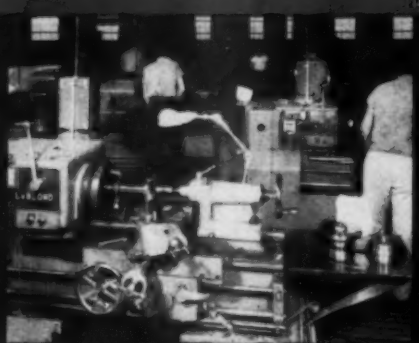
▶ Lathe craftsmen like these need . . .

▶ smooth, responsive controls . . .

▶ simple, convenient speeds . . .

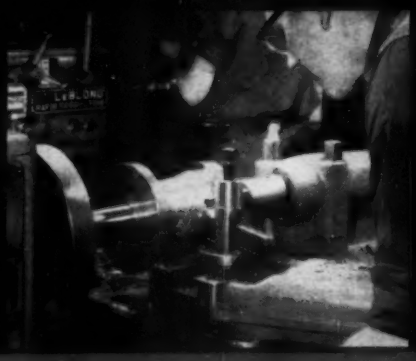


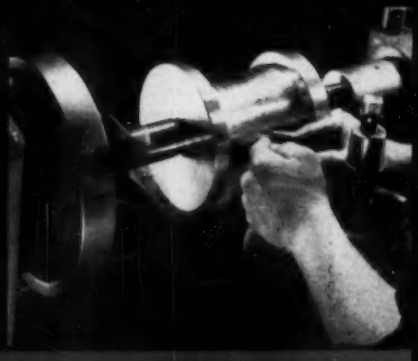
▶ bought 2 new LeBlond Rapid Productions . . .



▶ To work alongside their 3 LeBlond Dual Drives . . .

▶ while one other-make lathe sits idle!

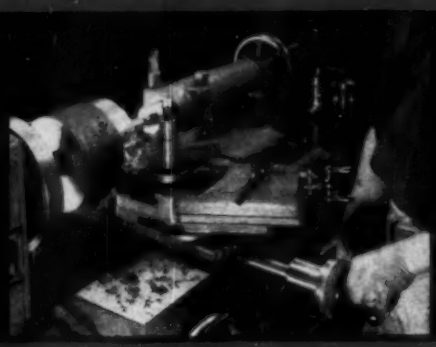


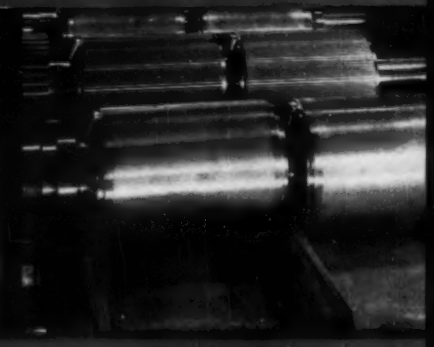


▶ First, females are roughed, then . . .

▶ turned to near-dimension . . .

▶ scraped with hand-held tool . . .

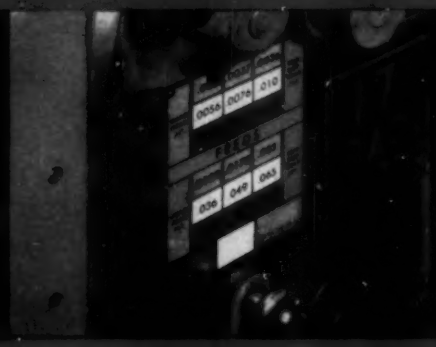


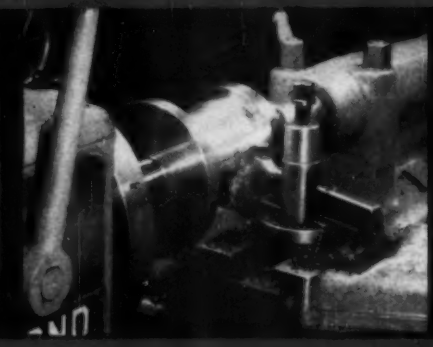


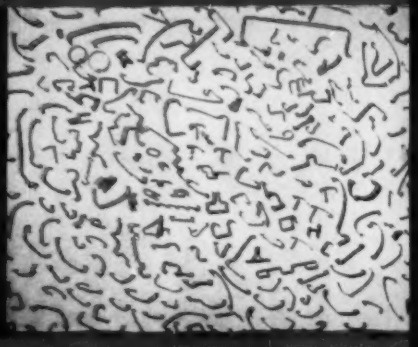
▶ Next, mating male is turned and scraped . . .

▶ checked with female using feeler gage . . .

▶ and final-checked in rolling mill . . .







▶ and feeds . . .

▶ power, and rigidity that lasts.

▶ That's why Dexter Roll Form Co., Detroit . . .

The R. K. LeBlond Machine Tool Company

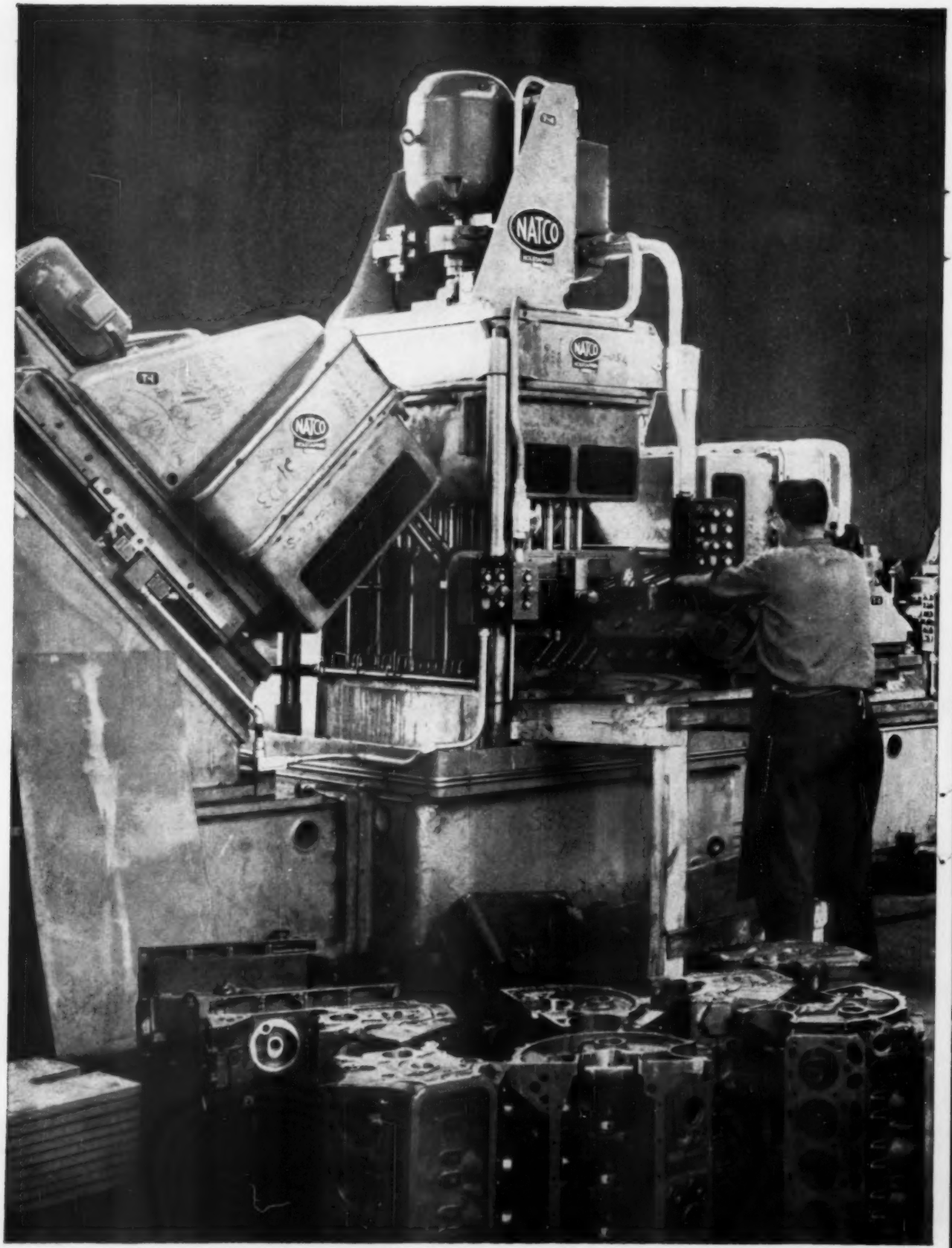
World's Largest Builder of a Complete Line of Lathes for More Than 71 Years

Cut with Confidence . . .

LeBLOND of Cincinnati

Cincinnati 8, Ohio

▶ Remember, with turning craftsmen, it's LeBlond. Ask them.

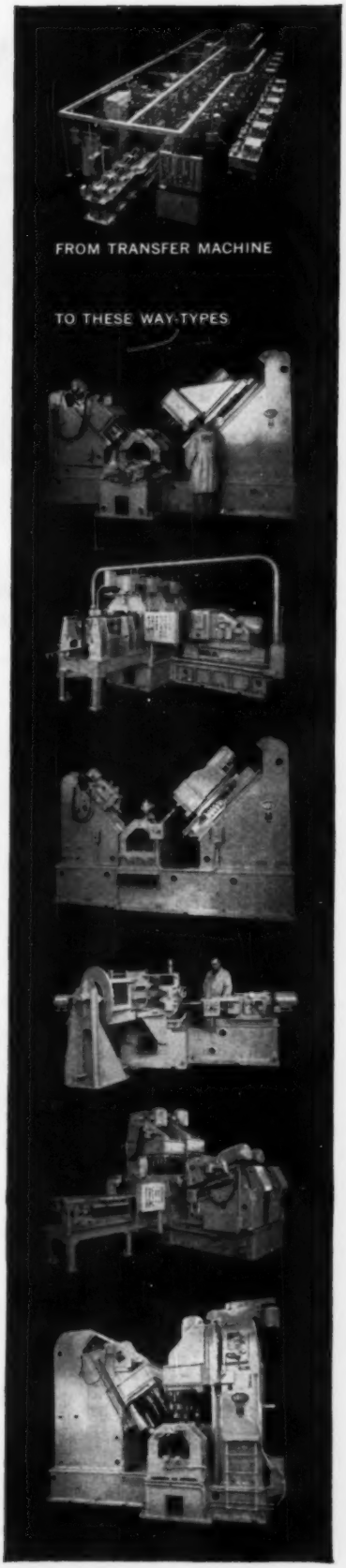

NATCO
NATCO
NATCO

Must your transfer machine go to scrap every time your model changes?

Certainly not. For example, the way-type machines shown here were once stations in an automated straight-line transfer machine. Now they will begin their second life as individual machines on a shorter-run lower-production assignment.

Each station in your Natco transfer machine—whether drilling, boring, milling, sawing or chamfering—is a machine tool in its own right. With modifications and new tooling, it may serve you for many years beyond its original "single-purpose" life.

When product changes call for new tooling, consider adapting the previous machinery to a new use—and realize substantial savings. Natco engineers and manufacturing facilities are at your disposal to make the necessary modifications. Call your nearby Natco representative today to discuss converting your equipment.



NATCO

Multiple-spindle drilling, boring, facing and tapping machines. Special machines for automatic production.

NATIONAL AUTOMATIC TOOL COMPANY, INC.

Dept. 294-A, Richmond, Indiana

Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles. Distributors in other cities.

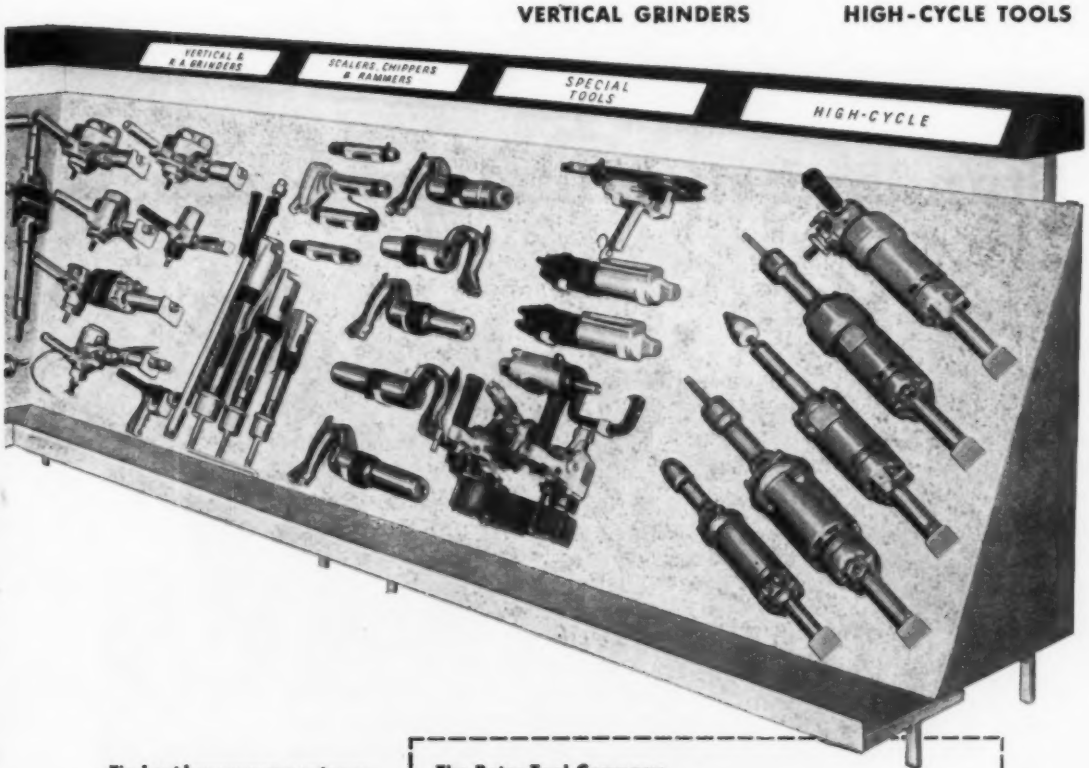
COMPARE!

(at our expense)

FOR POWER
FOR TIME SAVING
FOR LOW MAINTENANCE
FOR EASY USE

..THE RIGHT TOOL FOR YOUR JOB!

ASSEMBLY TOOLS
DRILLS
STRAIGHT GRINDERS
VERTICAL GRINDERS
SCALERS...CHIPPERS...RAMMERS
SMALL WHEEL GRINDERS
SPECIAL TOOLS
HIGH-CYCLE TOOLS



Find out how you can cut your costs with ROTOR TOOLS. Ask for a free demonstration. Mail the coupon today.

The Rotor Tool Company
26300 Lakeland Avenue
Cleveland 32, Ohio

☐ Please demonstrate Rotor_____ in our shop.
☐ Send literature for_____

Company Name_____
Company Address_____
Your Name_____
Position_____
City_____ **Zone**____ **State**_____

for management

The experienced investor examines his portfolio of securities frequently, buying or selling to adjust to changing conditions and improve his earnings.

The metalworking executive is an investor, too, responsible for constantly checking his investment in machine tools. He knows that shrinking returns on outmoded equipment can squeeze him right out of competition.

If you are currently surveying your "portfolio" of machine tools, it will pay you to consider an investment in Avey production equipment, which in many cases has earned its acquisition price in less than two years. Avey Division, The Motch & Merryweather Machinery Co., Box 625, Cincinnati 1, Ohio

Standard machine price equals

for production men

The flexibility of "standard" equipment and the production of "special" are combined in this 62-foot Avey Line-O-Dex machine.

Operations on the jet engine diffuser case include drilling, countersinking, reaming, and lead screw tapping.

One fixture moves both linearly and radially to index the part. Add a second fixture and you double production.

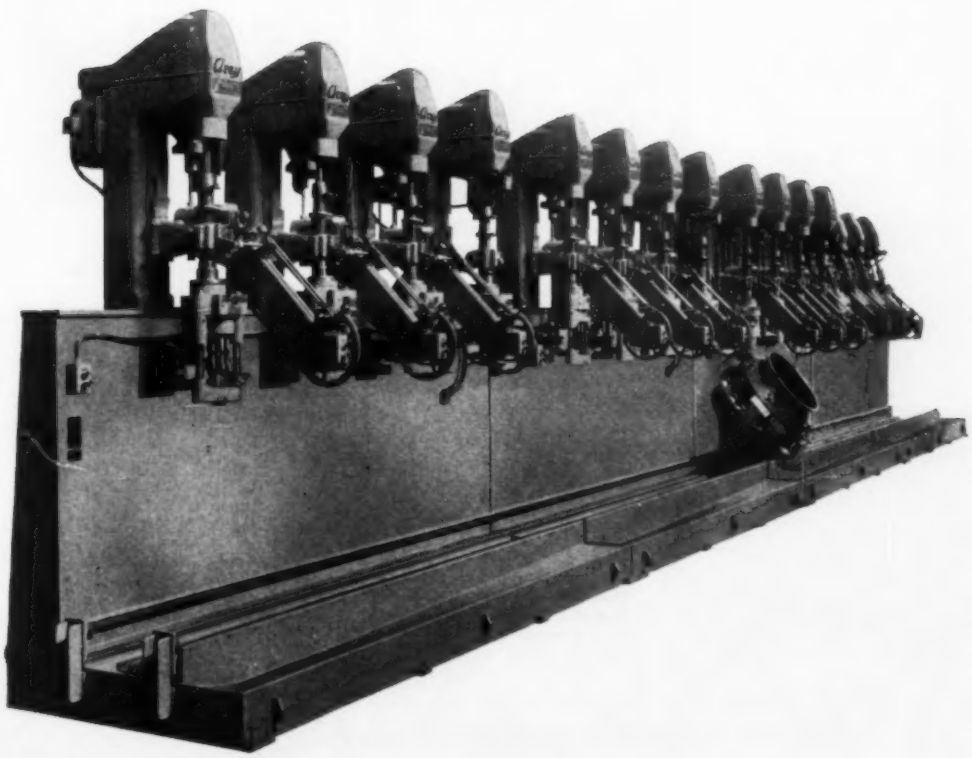
Standard drilling columns are arranged with multiple spindle drill heads which have power feed, four rates of feed, adjustable speeds, and additional head and quill travel to permit easy changeover to a new design.

Transfer mechanism is supported by the base. Another example of Avey's customer-oriented engineering.

Avey

drilling, tapping, production machines

special machine profit



NOW AVAILABLE *IN GRINDING WHEELS*
FROM YOUR REGULAR SUPPLIER!

G-E MAN-MADE DIAMONDS

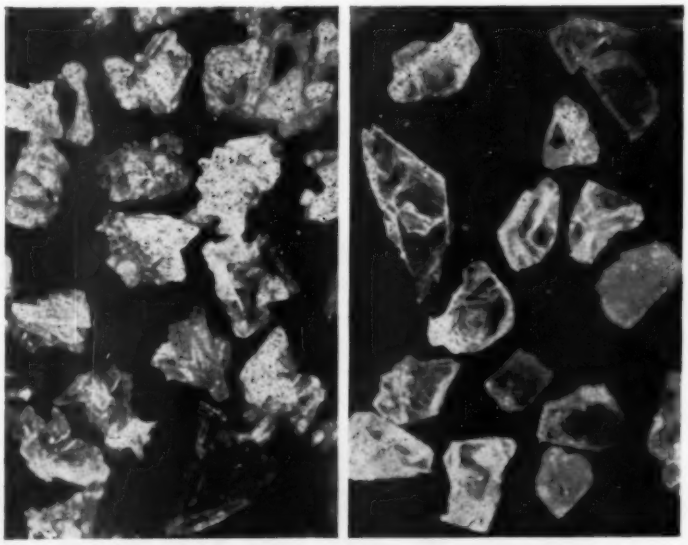
Now proved in production use... out-perform natural diamonds in the majority of carbide grinding operations!

Now cost-conscious manufacturers have proved what laboratory and field tests had already indicated; in actual production use, resinoid or vitrified-bond wheels with General Electric Man-Made industrial diamonds had at least 15% and up to 75% higher efficiency in most carbide grinding applications than wheels with natural diamonds.

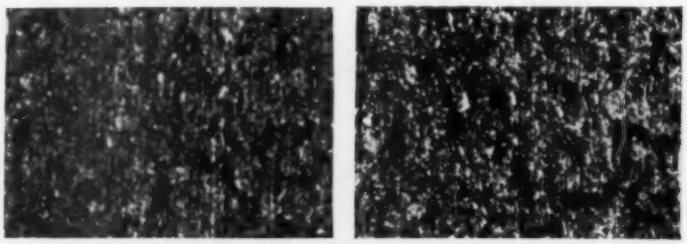
Production experience shows that wheels with G-E Man-Made Diamonds remove more carbide, with less wheel wear and with 20-35% less power consumption. They maintain sharper cutting edges; cut more freely; produce surface finishes that are as good, or better, than those obtained with natural diamonds. The result: A considerable reduction in production costs.

Man-Made Diamonds are better, because, while their chemical properties are the same as those of natural diamonds, their crystal shape is importantly different. Man-Made Diamond crystals are more blocky and rough surfaced. This provides extra support in the bond – makes them stay in the wheel till more completely used up—minimizes the waste of lost diamonds. They are also more friable, so that sharp, new cutting edges are constantly presented throughout the grinding operation.

Your grinding-wheel supplier offers them now. If you're using resinoid or vitrified-bond diamond wheels, specify General Electric Man-Made Diamonds in your next order. Cash in on the superior performance that's already cutting costs for other manufacturers! *Metallurgical Products Department, 11149 E. 8 Mile Road, Detroit 32, Michigan.*



Man-Made Diamond Crystals (left) are rough and blocky; natural crystals (right) are smooth. General Electric Man-Made Diamonds stay bonded longer, cut more freely, take 20-35% less power.



Close-ups of worn grinding wheel faces show that, after use, a wheel made with General Electric Man-Made Diamonds (left) invariably shows considerably fewer voids where crystals have become dislodged than does a wheel with natural diamonds (right). Man-Made Diamonds tend to remain in the bond longer and continue to do an efficient cutting job until almost completely used up.

Progress Is Our Most Important Product

GENERAL ELECTRIC

PRODUCTION POINTERS from GISHOLT

More cost-cutting IDEAS– to help you

HOW DeLAVAL SAVES 383 MINUTES ON PROBLEM PART

Automatic and turret lathes team up with JETracer equipment for large workpieces

If you can apply this basic idea to your work, you're due for big savings. At the DeLaval Company's Poughkeepsie, New York, plant it cut former machining time 70% and eliminated a 1½-hour polishing job.

The workpieces are separator bowl shells of tough 302 stainless. The parts are rough-machined on two Gisholt No. 24 Automatic Production Lathes with JETracer-equipment. They are finished on two 3L Saddle Type Turret Lathes—each equipped with two JETracer slide tools mounted on the hexagon turret. Each JETracer slide tool is an independent unit with its own overhead sliding template carrier that locates for length from an adjustable bracket on the overhead pilot bar. Forward feed of the turret saddle causes the tracer stylus to follow the template contour, reproducing the form in the workpiece. The entire assembly indexes with the turret and does not restrict the use of other tooling.

A variable-speed, constant-h.p. (30) drive motor is used. An indexing speed template, at the rear of the turret carriage, indexes with the turret and provides a constant cutting speed when either JETracer slide is used, without stopping the spindle or removing the tool from the cut.

Finish Operation 1 on 3L

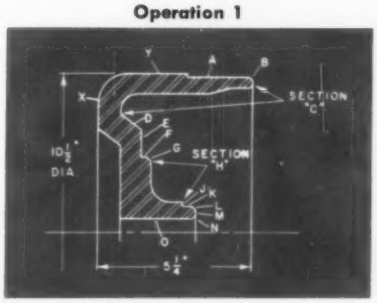
A 21″ chuck holds at Y, locates at X. Hex 1 tools rough F, rough-bore O. Hex 2 traces sections M-H-D. Tool post tools face B-J, turn K. Hex 3 finish-turns F. Hex 4 chamfers N and A is turned from the tool post. Hex 5 traces section C. Tool post tools chamfer B-G-L and F is finish-turned from hex 6. F.t.f. time, only 70 minutes.

Finish Operation 2 on 3L

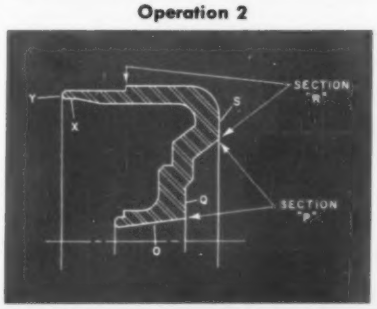
The workpiece is hand-clamped at S, centralized at X and located at Y for the second operation. Hex 2 step-bores O, and tool post tools rough-face Q in two passes and finish-taper-bore O in three passes, using the taper attachment on the square turret carriage. Hex 3 is open. Section P is traced from hex 4. The spindle is then stopped; an air-operated clamp is inserted, holding at Q; hand clamps are removed from S, and section R is traced from hex 1 to complete the part. Time, f.t.f., 30 minutes.

JETracer, using inexpensive single-point tools, machines complicated surfaces accurately, holding bores to .0008″, diameters to .0008″, depths to .004″. Combined No. 24-3L setup completes part in 167 minutes, saving 383 minutes over previous methods. 20 micro-inch RMS finish is obtained, saving a 1½-hour polishing operation.

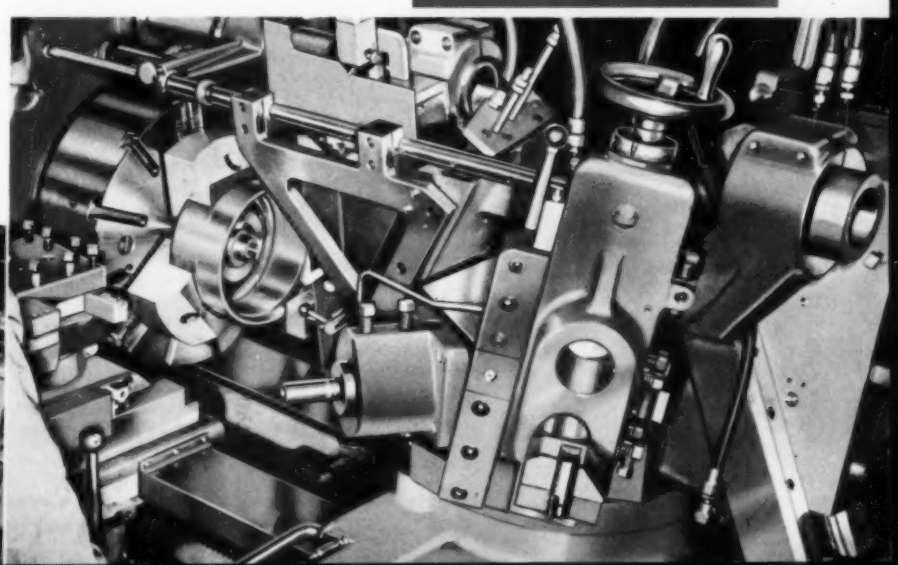
Operation 1



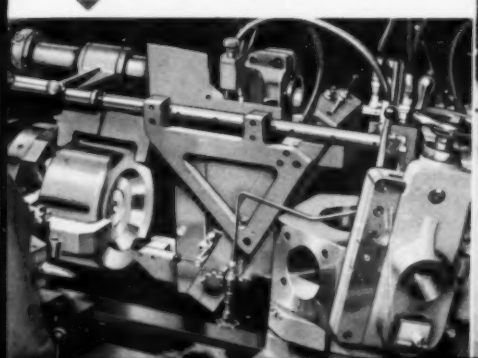
Operation 2



Workpiece and tooling for first finishing operation on 10½"-diameter, 5¼"-wide bowl shell. Note JETracer slide tools mounted on opposing faces of the hexagon turret.



Close-up of workpiece and turret-mounted JETracer slide tool for second finishing operation. Note how overhead sliding template carrier locates for length from adjustable bracket on overhead pilot bar.



WANT TO SIMPLIFY FIXTURE WORK AND SAVE MONEY?

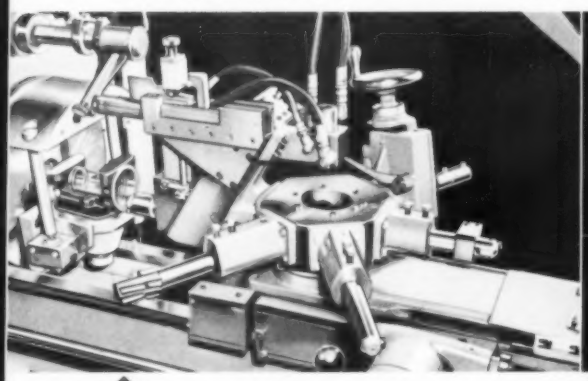
JETracer slide tool cuts tooling costs for ram type turret lathe work

If you have to machine parts held in fixtures or handle multiple-diameter boring operations, tuck this page in your files for reference. It shows how tracing can cut your costs, save time and simplify machining of parts like this chrome-nickel-steel truck steering knuckle forging.

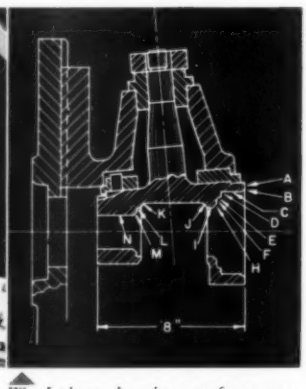
The spindle end, previously machined, is located from a circular slot on the spindle O.D. The part is hand-clamped in a counterbalanced angle plate fixture on a standard MASTER-LINE No. 5 Ram Type Turret Lathe. Although the part and fixture require a swing clearance of 21¾", the standard No. 5 handles it without modifications. A saddle extension is used to minimize tool overhang and provide maximum rigidity when finishing to close-tolerance bores.

The turret-mounted JETracer slide tool on hex 1 simplifies machining and eliminates the additional tooling normally required to machine the eight separate surfaces at the front of the part. Length setting is speeded by a feed dial, an integral part of the standard longitudinal feed handwheel assembly. As the turret ram feeds forward, the tracer stylus and the tool-carrying slide follow the template contour, generating surfaces A-B-C-D-E-F-H-I in one pass. A multi-diameter cutter on hex 2 machines L-M-N. N is finish-bored from hex 3 and diameters C-I are finished from hex 4. A rapid slide tool on hex 5 bores and forms J-K to complete the part. Tolerances on the 8"-long part are held within .0014" on bore C, within .001" on bore N and within .005" on bore I. F.t.f. time is only five minutes.

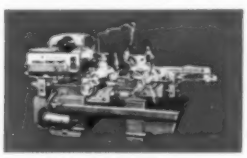
Turret-mounted JETracer slide tool saves time, eliminates need for usual cross-slide carriage and extra turret tooling, reducing original equipment cost. Entire JETracer assembly indexes with the turret and does not restrict use of other tooling.



Workpiece and tooling showing how tracer template and carrier bar obtain length location from adjustable bracket attached to overhead pilot bar. Note absence of standard cross-slide carriage and consider savings in original equipment and tooling made possible by JETracer.



Workpiece showing surfaces machined with this setup. Turret-mounted JETracer slide tool handles eight surfaces on right end of part in one pass, saving time and simplifying operator's job.



HOW SACO-LOWELL SHOPS INSPECT HIGH-SPEED TEXTILE PARTS

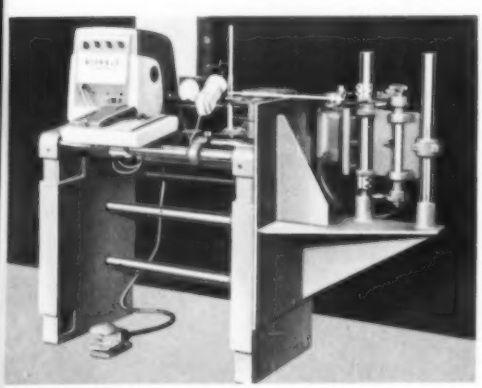
Balancing before assembly saves time, cuts losses

Vibration can be costly in the textile industry where speeds of 11,000 r.p.m. are not uncommon. At these high speeds, even small amounts of unbalance exert great force on supporting bearings and cause high-frequency vibrations that can lead to excessive maintenance and spoiled work. Here at the Saco-Lowell Shops, Biddeford, Maine, a Gisholt 1SM Balancer is used to check product quality *before assembly* to eliminate costly time and production losses caused by vibration in high-speed spinning operations.

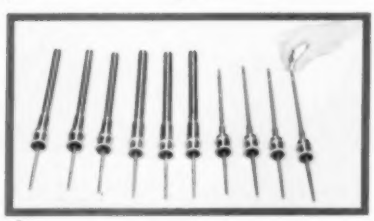
Typical parts shown below include whorl-and-tube and blade-and-whorl assemblies used to support and drive the tubes or bobbins of yarn used in manufacturing textiles. The long, lightweight spindle operates at from 8,500 to 11,000 r.p.m.

To simulate actual operating conditions, the balancer is set up to rotate parts in vertical position. Standard, horizontally mounted driving motor and vibration pickups are tipped 90° and mounted at the right end of the machine. A bolster insert, which is an actual part of the spindle, provides bearing surfaces to support the spindle blades and is held at the base end in a special vibratory fixture. The spindles are belt-driven from the crown pulley on the whorl as in actual production. The driving motor is easily adjusted, up or down, to align the pulley with the part when changing over to different sizes. Because electrical means are used to locate and measure unbalance, there is no restriction on the method used to support or drive the parts. Full machine accuracy permits measuring bearing movements as small as .000025" in either one or two preselected correction planes. The average workpiece is inspected for unbalance in less than one minute.

This simple, effective means of checking parts and assemblies before they are placed in operation eliminates costly time and production losses through broken yarn or rapid wear caused by excessive vibration of high-speed parts.



Driving motor and vibration pickups are mounted at right end of balancer to permit balancing of high-speed textile machinery parts in vertical position.



Typical parts checked for unbalance with this setup. Hand gives size comparison. Operating speeds of 8500 to 11,000 r.p.m. make inspection by balancer imperative for smooth, trouble-free operation.

ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT

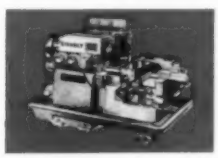
HOW TWIN DISC SIMPLIFIES CONTOUR MACHINING

JETracer provides finer finish; auxiliary slide handles extra surfaces

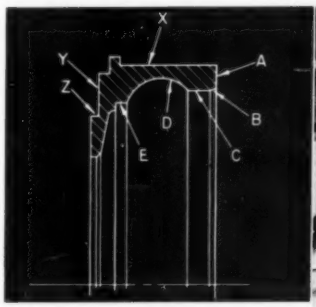
Here's a way to avoid the high cost of form tools as well as the cost of re-grinding and lost machine time while tools are changed and reset to size. It's the way the Twin Disc Clutch Company's Hydraulic Division plant at Racine, Wisconsin, uses a standard MASTERLINE No. 12 Automatic Production Lathe with modern JETracer to generate a large radius in cast iron rotating housings for hydraulic torque converters.

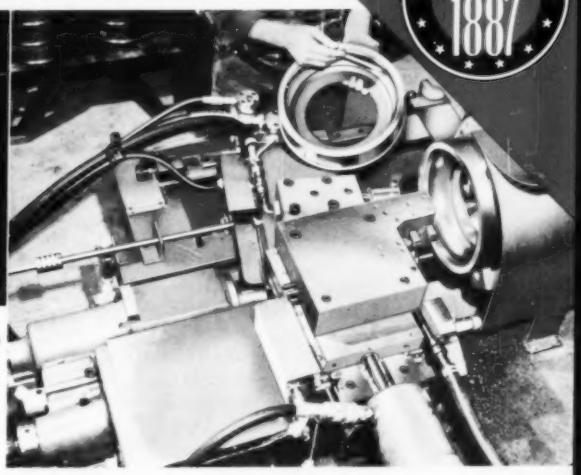
Special equipment includes a front-carriage JETracer slide and a single-pass template carrier, adjustable longitudinally and for taper. A variable-feed pump is used for the front carriage to provide a uniform feed rate to the single-point tracing tool, especially important for a fine surface finish as the tool generates the steep contour in the bore.

Here's the operation on a typical 12⅜"-diameter, 3⅜"-wide part. Surfaces X-Y-Z are previously machined. The work is centralized on diameter



Z with a chuck-mounted pilot ring, located against face Y and chucked at X in a 15", 3-jaw, compensating-type air chuck. The front JETracer slide rough-bores C and generates the 31/32"-radius D. At the same time, the rear independent slide finish-bores C-E and chamfers B, using standard longitudinal feed movement. Then an auxiliary slide, mounted on the rear slide, rough- and finish-faces A to complete the part. F.t.f. time is only 3.12 minutes.





Operator indicates 31/32"-radius, 1⅛"-long-groove D. Note massive tool block, mounted on auxiliary slide to permit machining extra surfaces using standard longitudinal feed of rear independent slide and transverse feed movement of the auxiliary slide.

Three different part sizes are handled with the same basic setup. Change-over requires new sets of chuck jaws, a different pilot ring, rear tool block and tracer template, and adjustment of stops.

JETracer speeds and simplifies radius or contour machining, improves product quality. Variable feed provides fine finish in 31/32"-radius, 1⅛"-long-groove D. Rigid setup holds parallelism between faces and size of bore C within .003" tolerance.

SAME MACHINE SUPERFINISHES INNER AND OUTER TAPERS

Two-machine setup corrects part geometry, eliminates rejects, saves time

Here's how a big automobile manufacturer uses this high-production Superfinishing setup to correct part geometry and save time on difficult inner and outer tapered surfaces.

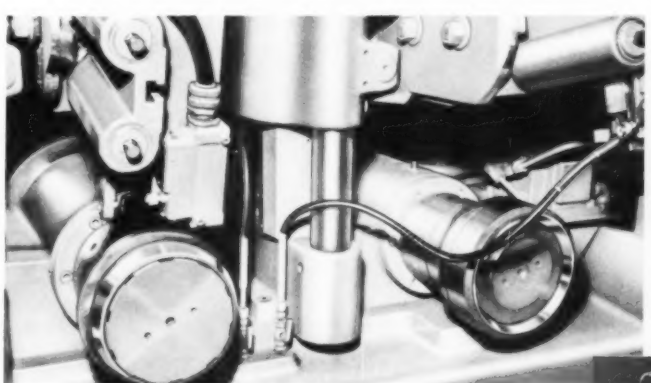
The workpieces are steel transmission cones which come to the Superfinisher turned, bored and heat-treated to 48-52 Rockwell "C", with a surface-finish of 80-100 micro-inches RMS. The operation is handled on two Model 54 High-Production, Two-Spindle Cylindrical Superfinishers. The Model 54 is ideal for this work since it is designed to handle parts of small or medium size, with two independent work stations.

Because previous operations cause some distortion and leave extra heavy walls on some pieces, one Model 54 is used to rough the O.D. and I.D. surfaces, correcting part geometry and cleaning up surface defects. The second machine produces the low micro-inch finish required for smooth operation and long service life.

The tapered outside diameter is handled on the left work station. The part is held in a fixture, centralizing and locating in the bore and clamping back on the lugs in the bore. The tapered inside diameter is handled on the right work station. The part is held in a collet-type fixture, centralizing and locating on the tapered O.D., clamping back against the lugs.

The roughing operation takes 40 seconds f.t.f. time at each station. The finishing operation is completed in only 30 seconds f.t.f. at each station. The final finish on both O.D. and I.D. surfaces is 3-4 micro-inches RMS.

Two-machine setup saves time, improves product quality. Using one Superfinisher to rough and another to finish virtually eliminates rejects because part geometry is corrected by roughing operation. Work flow is fast, from left to right, with one operator on each machine.



Close-up of tooling setup on two-spindle Model 54 Superfinisher. Tapered O.D. is handled on left station; tapered I.D. is handled by offset stone-holder on right station. General machine view shows control panels for individual stations that permit handling different operations on same machine.

MASTERLINE GISHOLT SINCE 1887

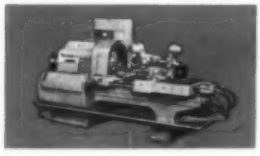
SETUP SAVES CUMMINS ENGINE COMPANY, INC., 1.5 MIN. PER PART

Combined operations cut time 35%, improve accuracy and finish

You'll want to remember this smart tooling setup at the Cummins Engine Company, Inc., Columbus, Indiana, plant. It shows how combined cuts are used to improve concentricity, parallelism and surface finish on die-cast aluminum diffuser plates for Cummins "Turbodiesel" Engines.

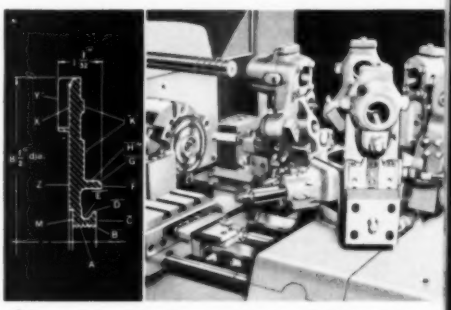
The machine is a MASTERLINE 1F Fastermatic Automatic Turret Lathe. Special accessories include a 2-speed motor, automatic forward and reverse spindle controls, a turret-facing attachment and a special turret-facing slide tool.

The parts are located against face X and held at W in a 12″, 3-jaw air chuck. Drive is against vane Y. Spring-loaded, manually locked pins provide extra support near center at Z.

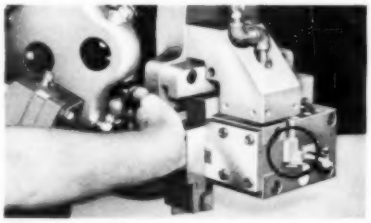


Here's the automatic machining cycle: Hex 1—drill A, rough-turn D-E-H, chamfer G while K is rough-faced from front cross slide; hex 2—semi-finish-turn H, bore A, chamfer B while rear cross-slide tools finish-face K, rough-face F; hex 3—turret saddle traverses forward and holds as turret-facing attachment on rear cross slide provides transverse movement to turret-facing slide tool, facing F-C and back-facing M at the same time. A cam-operated auxiliary slide, inside the turret-facing slide, follows an angular path, entering the limited space between face F and diameter D to undercut E. Reverse feed is used to clean up the surfaces and clear the tools for withdrawal. Hex 4—finish-turn H; spindle reverses and low-speed side of motor is used while a left-hand, 10 TPI thread is tapped in bore A from hex 5. When tap bottoms, turret dwells and spindle reverses to withdraw tap. Spindle speed is increased as A is bored from hex 6, removing the crest from the threads to create an oil-slinger groove. Groove depth is held to ±.006″ to govern flow of oil to the turbocharger. Time, f.t.f., is only 2.7 minutes.

Flexible automatic cycle and minimum special tooling permit machining of undercut, tapping and simultaneous facing of front and back surfaces; save extra operation and assure parellelism between faces.



Workpiece and tooling for die-cast aluminum diffuser plates. Rigid setup with overhead-piloted multiple tool holders simplifies holding close tolerances. Workpiece drawing at left shows surfaces machined.



Close-up of special turret-facing slide tool. Note cam-operated auxiliary slide, encircled, used to undercut E.

JETracer SAVES 71.5 MINUTES ON THIN-WALL PART

Four-pass JETracer slide saves time, improves accuracy and finish

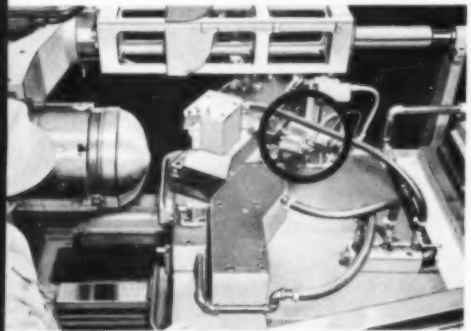
If you're having trouble machining thin-wall parts with difficult contour, facing or forming cuts, this setup at a well-known manufacturer's plant will give you fresh ideas.

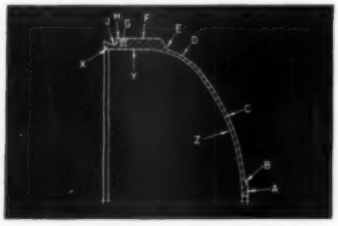
The workpieces are tough 4031 steel pressure bulkheads. A standard MASTERLINE Simplimatic Automatic Lathe is used. Special equipment includes a JETracer-controlled rear independent slide with a 4-pass indexing template carrier and variable-speed motor to provide a constant surface-cutting speed.

The 14″-diameter, 6⅜″-wide parts are located on face X, against a locating ring with jacks supporting at Z, and chucked at Y on a 15″, 3-jaw, air-operated chuck. Pie-shaped jaws centralize and minimize distortion.

Here's the automatic machining cycle: The platen table feeds to bottom and holds as dome face A is machined from the front slide. The table retracts and then feeds in while O.D. surfaces B-C-D-E are traced. A variable-spindle-speed control provides a uniform surface-cutting speed on all diameters. Then, the table and JETracer slide retract; the template carrier indexes, and the same surfaces are traced again. Four passes are required to finish O.D. contour. After the last JETracer pass, the front slide forms locking groove surfaces F-G-H-J. Final wall thickness is .073″. Surface finish is 40-50 micro-inches RMS. Time f.t.f., 18.5 minutes.

Multiple-pass JETracer slide permits one to three roughing cuts and final finish cut. Relatively inexpensive accessories and standard Simplimatic save extra operations and cut 71.5 minutes from previous time on this job.





Compact tooling arrangement simplifies machining of problem part. Note 4-pass indexing template carrier above independent JETracer slide. Rheostat, encircled, at right of JETracer slide varies spindle speed during tracing.

No. 7-858
710

The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Printed in U.S.A.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

PRECISION BORING with no rejects

SAVE 300 HOURS PER UNIT

on precision boring of gear boxes. Each unit (2 halves) calls for over 200 holes from ¾" to 4½" dia. Boring, spot facing, recessing, milling, tapping and counter boring. Material is aluminum alloy.

hole location accurate to ±.0001"

hole sizes repeated to ±.0001"

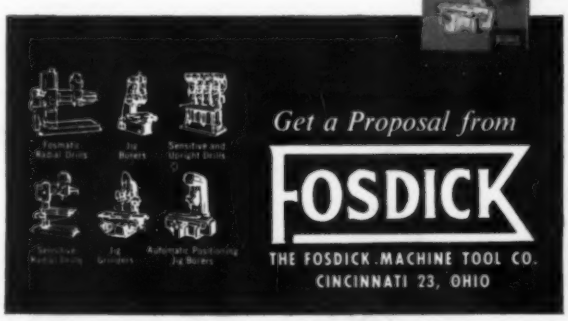
Boring time reduced from 800 hours to 500 hours per unit—with no rejects in all 50 parts—and every one accurate to ±.0001" on hole size and location! Over 200 holes per unit are machined.

Mr. R. Schmidt of Triangle Tool Co., Union, N. J., owner of this Fosmatic Jig Borer, reports, "Two Fosmatic features were largely responsible for this important time saving. First, the Fosmatic's long table travel permitted machining two parts at once. Second, the automatic positioning and Direct Dimension Measuring System work simply and fast. They eliminate confusion and help the operator work accurately and efficiently. Incidentally, that long table travel helped get us several new jobs we could never have handled on our other jig borer."

With Direct Dimension Measuring the operator sets dimensions direct from blueprint onto two direct reading drum dials. At the press of a button, the table automatically positions work to ±.0001". On the Fosmatic, this operation and all other machine functions can be numerically controlled by punched tapes or cards.

Fosmatic Jig Borers bring you many important advances in boring technology. Where progress has been so great, the obsolescence of your old machine may be more costly than you suspect. *Why not run a check?* Call your Fosdick Distributor or write us today.

Ask for Fosmatic Jig Borer Bulletin JB-A

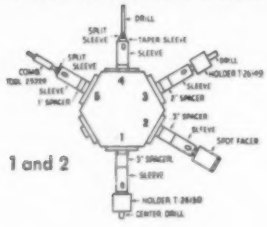


Machining costs of Carburetor Bowls with *Burgmaster* 2BH

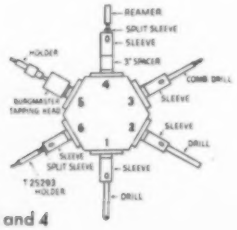
(¾" DRILL CAPACITY IN STEEL)

One man conveniently runs a bank of 4 Burgmasters which require only loading, unloading, and starting. The line now includes 12 machines arranged in 3 banks of 4. Note the easy stock handling system.

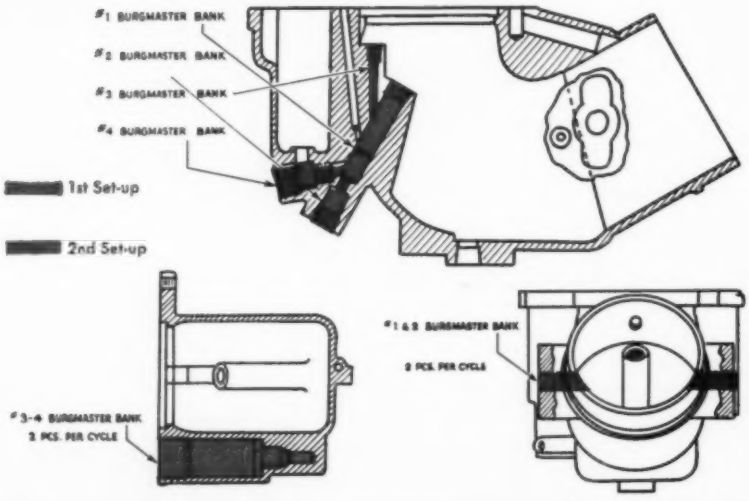
How the Job is Set Up



Machines 1 and 2



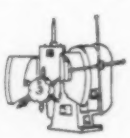
Machines 3 and 4



Specialists in High Production Turret Drilling

1C Manual Power Index ¾" Capacity

2B Manual Power Index ¾" Capacity



2BF Flange Mounted Power Index ¾" Capacity

2BH Automatic Hydraulic ¾" Capacity

3BH Automatic Hydraulic 1½" Capacity

2BR Ram Type Radial Drill ¾" Capacity

2BHT—3BHT Automatic Tape Controlled ¾" and 1½" Capacity

reduced from $24.39 to $5.36 per 100

(AT ZENITH CARBURETOR—DIVISION OF BENDIX AVIATION)

Automatic Hydraulic Turret Drills

In Addition:

1. 8 Burgmasters replace 18 Vertical Drills
2. 8 Fixtures instead of 18
3. Considerably less set-up time
4. Greatly reduced stock handling
5. Greatly reduced jig handling and jig storage
6. Greatly reduced floor space
7. Same machine used for several different sizes
8. Quick Set-up

Good tool processing, taking advantage of Burgmaster 2BH Automatic Hydraulic 6-Spindle Turret Drills, results in savings of $19.03 per 100 in machining cast iron carburetor fuel bowls at Zenith Carburetor Division of Bendix Aviation, Detroit, Michigan. Two banks of four machines each replaced the original 18 vertical drill presses used on this job. The line is now expanded to 12 Burgmasters. A series of operations, including center drilling, drilling, reaming, spot facing, pressing in bronze bushings, line reaming bushings, chamfering, and tapping are carried out automatically in two set-ups to complete the bowls in a minimum of time and effort. The first bank of Burgmasters produces 69 pieces per hour while the second bank produces 94 pieces per hour. The machines are pace setters, automatically doing the work and the thinking—requiring only loading, unloading, and starting by pressing a button.

This production record is made possible by the efficient automatic machine functions of the Burgmaster Model 2BH Turret Drills. The turret is power indexed, permitting skip indexing and selecting the desired spindle, speeds are preselected for each spindle, and pre-selective, infinitely variable feeds assure fine finish and accuracy. In addition, accurate micro adjustable depth control for each spindle is provided, and automatic rapid approach and return saves valuable machine time and speeds the machining cycle. All operations are performed at the most efficient rate commensurate with fine finish, accuracy, speed, and longest tool life.

Maximum Flexibility is Assured—

because all machine functions are adjustable, the machine can be set up with different tools and fixtures in approximately one to one and a half hours to produce other parts—automatically.

Burgmasters may be supplied as complete production units, including fixtures and tools ready to go into production. Manufacturers are finding they may be tooled to replace many different types of machines to effect substantial savings, increase production, and cut costs. Why not ask a Burgmaster field engineer to make recommendations on your work? There is no obligation.

Job Facts:

Machines—Burgmaster 2BH Automatic Hydraulic Turret Drills
Company—Zenith Carburetor, Division of Bendix Aviation, Detroit, Mich.
Part—Carburetor fuel bowls
Material—Cast Iron
Quantity—300 to 1500 per lot
Fixtures—Simple holding devices
Former Method—18 Vertical Drills requiring 18 fixtures
Former Costs—$24.39 per 100 units
Present Costs—$5.36 per 100 units
Savings—$19.03 per 100 units + 10 Fixtures, greatly reduced set-up time, stock handling, jig handling, jig storage, and floor space.

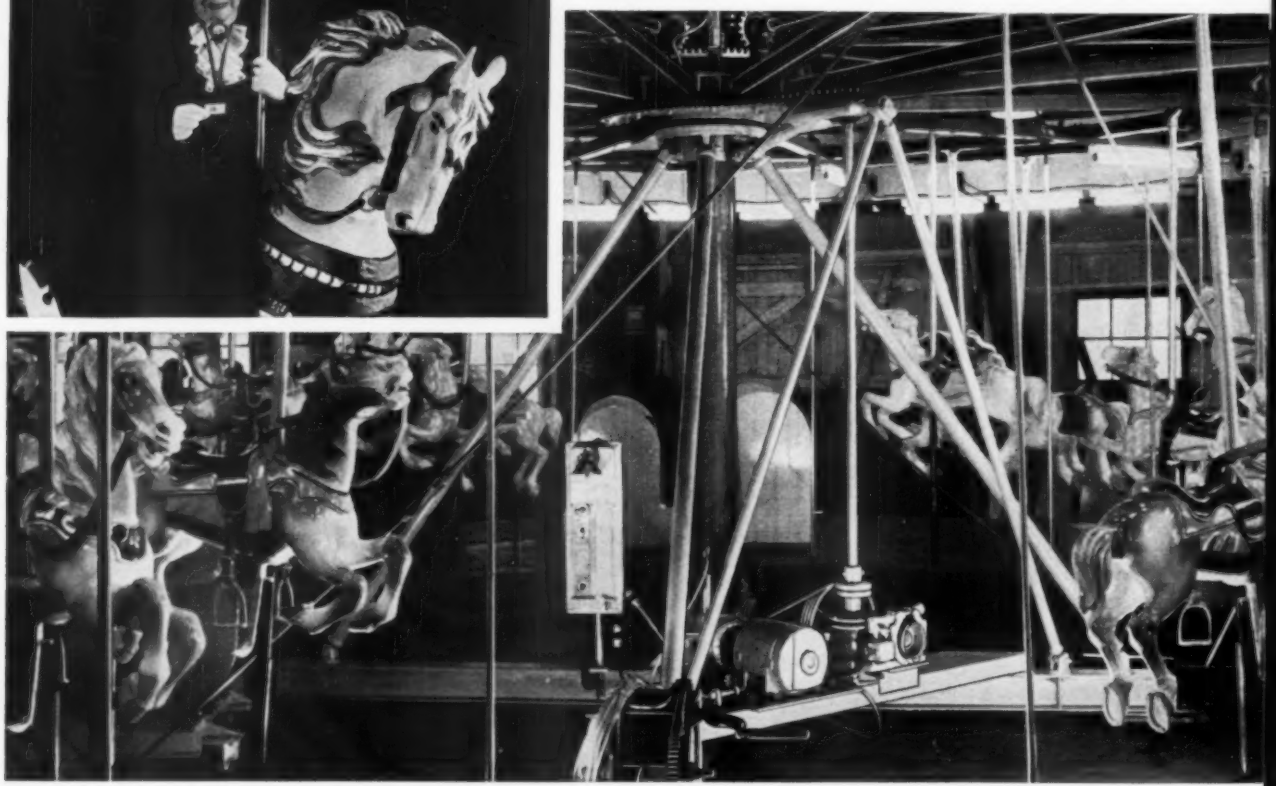
Write for bulletin describing Burgmaster 6 and 8 spindle Automatic Hydraulic Turret Drills in detail. Twenty-minute 16mm sound film showing Burgmaster turret drills in operation, including the new automatic positioning table, available from any office.

BURG TOOL
MANUFACTURING COMPANY, INC.
15001 South Figueroa Street, Gardena, California
Tel. FAculty 1-3510, TWX—Compton, California 6011

BURGMASTER DIRECT SALES OFFICES:

NEW JERSEY: BURGMASTER EASTERN SALES DIV., 86 N. Maple, Ridgewood, N. J., Ph. GI. 4-3002, TWX—Ridgewood, N. J. 724
CHICAGO: BURGMASTER MACHINERY, INC., 5329 Lincoln, Chicago 25, Ill. Ph. Long Beach 1-1178, TWX—CG 3353
CLEVELAND: BURGMASTER OHIO SALES DIV., 14706 Detroit Ave., Cleveland 7, Ohio, Ph. AC 6-3700
DETROIT: BURGMASTER MICHIGAN SALES DIV., 13730 W. 8 Mile Rd., Detroit 37, Mich., LI. 8-4333
SAN FRANCISCO BAY AREA: WALT COOPER, 1341 Old Country Rd., Belmont, Calif., Tel. LYtell 1-0309
Plus dealer representatives in other industrial centers.

Since 1880, Allan Herschell Company, Inc., North Tonawanda, New York, have created safe, appealing rides in the highly specialized field of engineering and constructing carnival and park amusements. Republic ELECTRUNITE is used extensively.



Meet severe design, engineering, service requirements with

Republic ELECTRUNITE Mechanical Tubing

ROUNDS... SQUARES... RECTANGLES

Republic ELECTRUNITE® Mechanical Tubing offers many outstanding fabricating advantages in the highly specialized field of creating, engineering, and constructing carnival and park amusements. That is why the Allan Herschell Company, Inc., world's largest manufacturer of merry-go-rounds and amusement rides, specify ELECTRUNITE.

For example, Republic ELECTRUNITE 3" Square Tubing is used for the sweeps which radiate from the top of the merry-go-round. Horses and other equipment are suspended from these sweeps, as well as passenger loads.

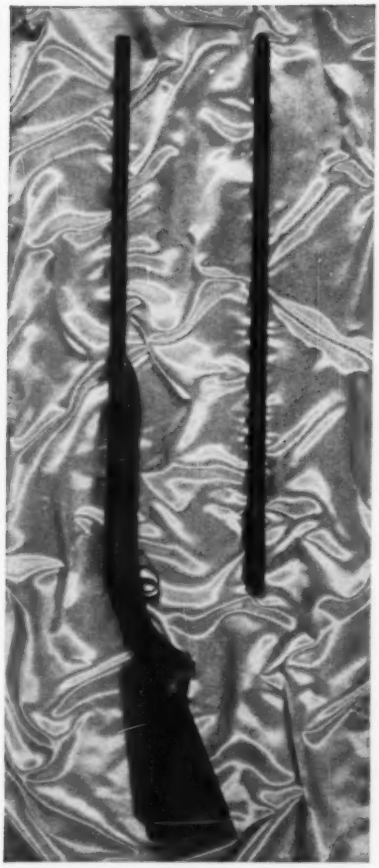
ELECTRUNITE is strong, rugged, lightweight with high strength-to-weight ratios that assure safe, dependable day-in, day-out operation. Because of this lightness and strength, portable amusement equipment built with Republic ELECTRUNITE is easy and economical to set up, take down, and transport.

With Republic ELECTRUNITE, strength, weight, and safety are built-in because ELECTRUNITE is quality controlled from Republic mines, through Republic mills, to manufacturing. ELECTRUNITE is produced from highest quality flat-rolled open-hearth steel, welded by the exclusive ELECTRUNITE process—a continuous electric weld method that unites the wall under pressure without the addition of foreign or extra metal. Tests prove the ELECTRUNITE weld is as strong or stronger than the original base metal.

Republic ELECTRUNITE Tubing fabricates easily, economically, with uniformity. It is available in a wide range of sizes and provides uniform wall thickness, ductility, concentricity, diameter, and other physical and mechanical properties in flanging, flaring, bending, expanding operations.

Let Republic engineers help you select ELECTRUNITE Tubing to meet your many and varied needs. Call your Republic representative or write today.

SOLVE DIFFICULT ASSEMBLY PROBLEMS WITH REPUBLIC HEX HEAD CAP SCREWS, available in a wide variety of steel analyses including ENDURO® stainless, alloy, high carbon (heat treated) and low carbon in sizes suited to all types of precision assemblies. Diameters range from ¼ inch to 2 inches inclusive, with lengths to 12 inches. Fine or coarse threads are provided in each size and material — and other head styles can be furnished on request or order. Write today.



REPUBLIC COLD FINISHED BARS answer the problems of deep-hole drilling, reaming, bore-burnishing, and long-length turning operations for Harrington & Richardson, Inc., leading manufacturers of all types of small arms. Investigate the many Republic Cold Drawn Bar advantages for your operations. Send for data.

REPUBLIC ALLOY STEEL shrugs off fatigue, terrific torque, high impact load, in motor graders built by Adams Division of LeTourneau-Westinghouse Company. The grader's full-floating, two-section drive axle is made of Republic Hot Rolled 4340 Alloy Steel, resists fatigue, is able to take high torque without permanent set. Write today.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. AM-5906
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

I would like to know more about:
Republic ELECTRUNITE Mechanical Tubing
☐ Round ☐ Rectangle ☐ Square
☐ Republic Cap Screws ☐ Alloy Steel ☐ Cold Finished Bars

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____

JONES & LAMSON MACHINE TOOLS

the man who needs
a new machine tool is
already paying for it

The Turret Lathe with a fully automatic thread-chasing cycle!

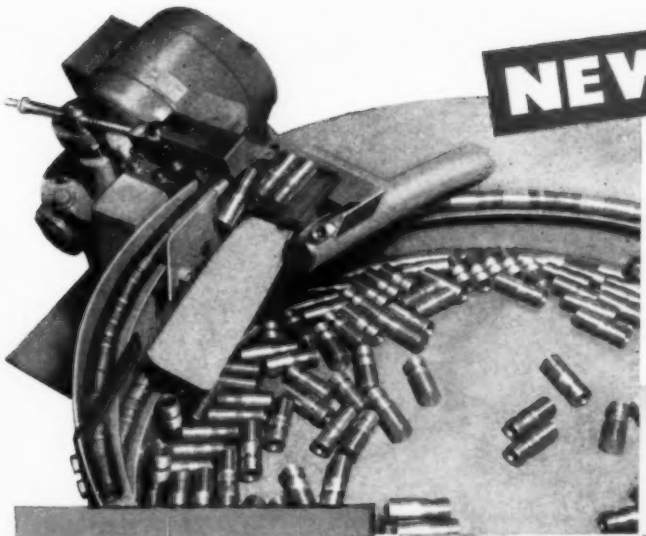
Here is full turret lathe versatility and a threading attachment with a fully automatic cycle — all in one machine. Now you can be sure of concentricity of threading with other lathe work, *all done in one chucking*, with the time saving of the Auto-Threader!

This Auto-Threader will chase straight or taper threads — or a combination — internal or external, from the front of the machine.

Other features include: uniform thread length, by means of positive stop and follower nut disengagement together with rapid tool withdrawal; precision lead control by full depth follower nut engagement on a hardened and ground leader.

Write for descriptive folder No. 5440. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

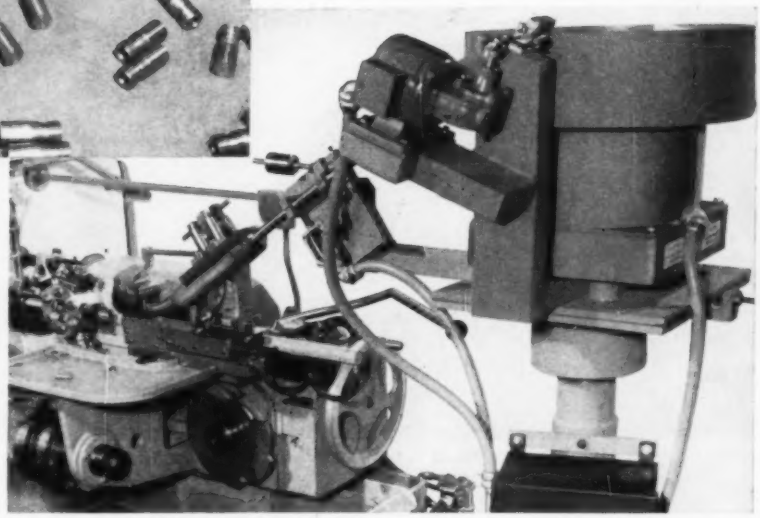
Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Thread Tools



NEW

BROWN & SHARPE
AUTOMATIC HOPPER FEEDER
for second operation work

CUTS LOADING TIME MORE THAN 50%



OPERATION

1. Workpieces are dumped in hopper.
2. High-frequency vibration of hopper causes pieces to climb spiral shelf along inside wall of hopper.
3. At top of spiral, pieces are tipped into mouth of tube leading to turret.
4. Sorting baffle at tipping mechanism rejects pieces approaching "wrong-end-forward."
5. Hopper vibration and flow of parts stops automatically when tube is full; starts automatically when more parts are needed.
6. Escapement at bottom end of tube synchronizes delivery of each piece to receptacle mounted in one port of turret, as it indexes to receiving position.
7. Receptacle grips piece, carries it 180° and delivers it to opened collet in spindle.
8. Collet closes and holds piece during required operations.
9. Collet opens and piece is ejected just before new workpiece is delivered by receptacle.

Automatic sorting and piece loading for B&S Automatics* permits added operations in a shorter cycle . . .

The new Brown & Sharpe Automatic Turret Loading Attachment takes the "slow-down" out of second operation work. Loading requires only normal turret indexes plus constant insertion time — as little as half the time required for other methods, such as cross slide chute loading.

All cross slides are available for tooling, and, for most jobs, five turret positions. More operations can be performed in a shorter time cycle.

Big savings in operator's time are assured, since feeding is fully automatic after parts are dumped in the hopper. Net production from machines equipped with these hopper feeders compares directly with production from machines on bar work with automatic bar loading.

A standard, self-contained device, the Automatic Turret Loader requires a minimum of special parts. Normally, changeover to accommodate another type part requires less than 30 minutes.

Find out how this arrangement can lower your second-operation costs. Send samples and prints for application study and report. Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

***Model** shown for use with new design B&S No. 2 Automatic Screw Machines only — capacity up to 1¼" diameter and 4¼" maximum length. Models to fit other sizes of B&S Automatics will be available soon.

PROGRESS IN PRECISION FOR 125 YEARS

Brown & Sharpe B·S

MILLING, GRINDING, AND SCREW MACHINES • MACHINE TOOL ACCESSORIES • PRECISION TOOLS • HYDRAULIC PRODUCTS • CUTTERS

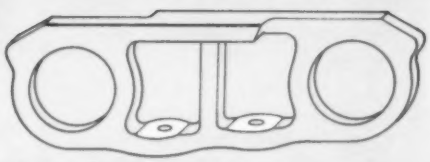
This job is a "natural" for broaching . . .

and the V-3 VERTICAL PULL-DOWN LAPOINTE

BROACHING MACHINE

is so efficient that it pays its way

although working only 1/3 of its available time!

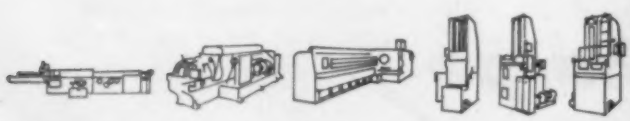


Steel forgings are tough to machine, but one of the world's largest producers of road-building equipment has substantially reduced production costs by Lapointe-Broaching the nut seats in steel-forged track links. Two 1¼" wide x 5/16" deep internal nut seats are broached in each link. Production is 170 complete links per hour, at 80% efficiency. And the interesting part of it all is that the investment in this Lapointe machine is paying off even though the broach *stands idle for two-thirds of the time!* . . . In your own shop there may be difficult operations that can be converted to Lapointe-Broaching from milling, shaping, etc., with an *improvement in quality, increased production . . . and lowered costs.* Why not invite an experienced Lapointe Field Engineer to call on you?

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



LAPOINTE

known to be the best in

BROACHING

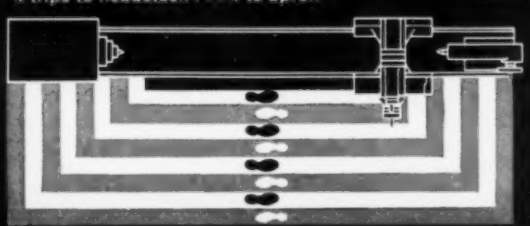
Lodge & Shipley POWERSHIFT PRESELECTOR GIVES PRODUCTION PLUS

- **TIME SAVING . . .** by eliminating "compromise speed setting" which can waste up to 50% of machining time.
- **INCREASED TOOL LIFE . . .** by using proper cutting speed. You save both tool time and money.
- **FINER FINISH . . .** with the right cut speed greatly reduces grinding required.
- **DECREASED EFFORT & ERROR . . .** preselection of cutting speeds offers another saving in operator time and effort.
- **PROVISION FOR THE FUTURE . . .** POWERSHIFT can be adapted for electronic programming or magnetic tape control.

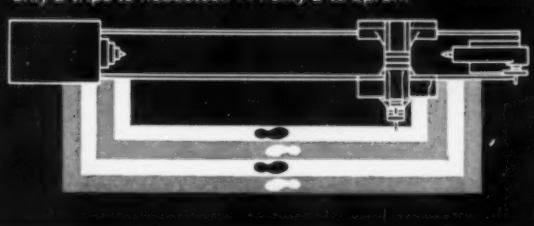
A SINGLE DIAL . . . COMPUTES! REMEMBERS! SHIFTS! You merely rotate cut speed dial to desired speed (dial computes speed if desired) . . . then, when preset speed is needed, shift to it immediately at the apron! One speed can be preset; up to six others "programmed" with handy indicator tabs. A Lodge & Shipley representative will be glad to explain fully. You'll find his name in the telephone yellow pages. Or, for detailed literature, write: **THE LODGE & SHIPLEY CO., 3056 COLERAIN AVE., CINCINNATI 25, OHIO**

With a long bed lathe and a job requiring 4 speed changes, an OPERATOR CAN SAVE ALMOST 50% OF HIS "HIKING TIME"

CONVENTIONAL HEADSTOCK . . .
4 trips to headstock . . . 4 to apron



POWERSHIFT PRESELECTOR . . .
only 2 trips to headstock . . . only 2 to apron!

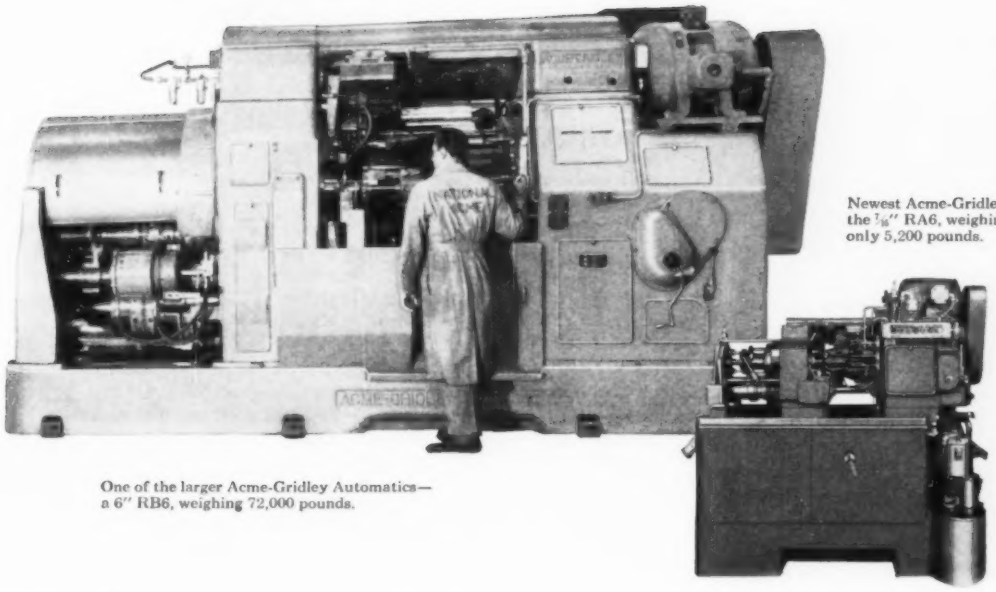


more than ever . . .

Lodge & Shipley

your LODGE-ical choice

Produce parts like these on



Newest Acme-Gridley—the $\frac{1}{16}$" RA6, weighing only 5,200 pounds.

One of the larger Acme-Gridley Automatics—a 6" RB6, weighing 72,000 pounds.

ACME-GRIDLEY automatics...

FORGET SECONDARY OPERATIONS!

Most parts machined on Acme-Gridleys are *completed* on Acme-Gridleys. Using these Automatics, you eliminate costly rehandling and, in many instances, avoid a sizeable second-machine investment.

The advantage applies to parts weighing fractions of ounces or hundreds of pounds. And the wide-open tooling zone of every Acme-Gridley lends itself to a broad range of installations limited only by the tool engineer's ingenuity. It means that, for sheer capacity range, no line of automatic production equipment in the world equals Acme-Gridley.

If you produce parts like the ones illustrated, then Acme-Gridley Automatics must be in your present plans. Our representative can give you expert assistance without obligation.

National Acme

THE NATIONAL ACME COMPANY, 171 E. 131st ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N.J., Chicago 6, Ill., Detroit 27, Mich.

Save TIME and MONEY cutting KEYWAYS

In one minute and for as little as one cent you can cut a keyway with a Minute Man Keyway Broach Kit. For keyways from 1/16" to 1" in any bore from 1/4" to 3".

Save time with these other
STANDARD STOCK BROACHES

SQUARE BROACHES

HEXAGON BROACHES

***New* ROUND BROACHES**

Used in an arbor or hydraulic press for finishing holes to exact size in *one pass*. 1/8" to 3/4" squares and hex's; 1/4" to 1" rounds. Production Type Keyway Broaches also in stock.

SEND FOR CATALOG AND PRICE LIST

The duMONT CORPORATION
Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name.....

Company.....

Address.....

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Illusion heightened

Dear Sirs:
Just to thank you for the realistic lead pencil featured on the front cover of the Tool Show Issue (*AM*—Apr 21 '58). As it lay on my desk the first day or so, I found myself reaching out to make use of that pencil.

Eventually, one of the people in the design section neatly overlaid the front cover with a thin sheet of Formica in which a slot had been cut accurately conforming to the shape of the pencil. The illusion was heightened by having the slot bevelled down to a razor edge. The magazine was then placed on the staff dining-room table where it foxed and amused most of the diners.

C D Mackinnon
Airdrie, Lanarkshire
Scotland

Heating wire

Dear Sirs:
In regards to the article entitled, "On-the-spot stress relief" (*AM*—May 19 '58, p141), could you furnish the address of the Arcos Corp which manufactures Heat-O-Coil wire?

G F Wiedemann
Creole Petroleum Corp
Cabimas, Estado Zulia, Venezuela

The address is Arcos Corp, 1500 South 50th St, Philadelphia 43, Penna—Ed.

Nose brush

Dear Sirs:
In your article on contour finishing of missile noses (*AM*—May 5 '58), you show a "Vonnegut brush" on page 103. Can you give us the manufacturer's name?

Hamilton Maze
Peru, Ill

The manufacturer is Grinding & Polishing Machinery Corp, 2530 Winthrop Ave, Indianapolis 5, Ind—Ed.

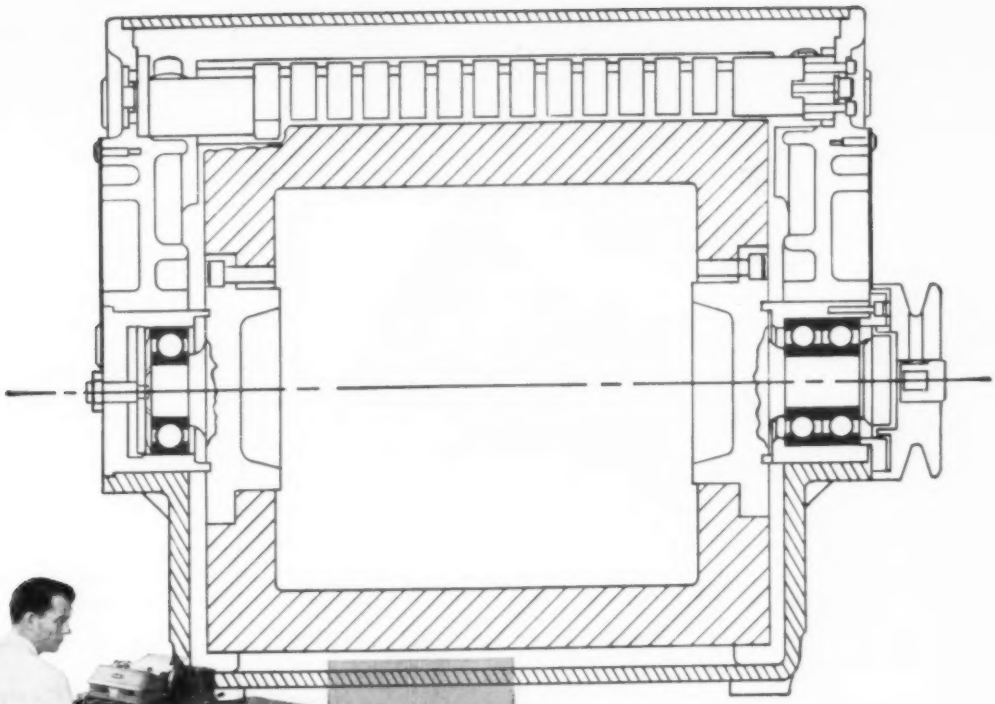
Correction

Dear Sirs:
In your article, "Ceramic Tools Gather Momentum" (*AM*—April

SHOPMATES

N. Jarvis

... YOU MEAN TO TELL ME YOU BEEN FIDDLIN' AROUND HERE FOR SIX HOURS AND YOU ONLY GOT TWO DONE ??
VEAH! AN' THEY'RE ALL GOOD ONES !! IF I WORKED THE WAY YOU HOT RODS WANT, I'D HAVE A DOZEN SCRAP PARTS AND A PILE OF BURNED UP TOOLS !!
THE WHIP DON'T KNOW IT... BUT... MAC TORTISE JUST SORTED THE GOOD FROM THE BAD... HE ONLY HAD THOSE TWO PIECES LEFT !!
N. JARVIS



"NO ROOM FOR ERROR"

in design of desk-size LGP- 30 digital computer!

Precise performance assured in Librascope's Fafnir-equipped LGP-30

Small as a desk, but it "thinks big"! No less than 4096 words can be recorded on the magnetic memory drum of the new Royal Precision Electronic Computer LGP-30. Moreover, this compact unit, made by Librascope, Inc., a subsidiary of General Precision Equipment Corporation, can be rolled where it's needed and plugged into any conventional wall outlet.

At the heart of this versatile computer, Fafnir super-precision type ball bearings maintain the precise alignment and high sensitivity required of the drum component. Counterbored to take a wide range of thrust, and radial loadings, these bearings provide the rigidity, extremely close-running accuracy, and low torque essential in this exacting application.

Fafnir's contribution to the development of the LGP-30 is another case history example of the high caliber and comprehensive scope of Fafnir design engineering services available to *you*. Take advantage of it when you have a bearing problem. The Fafnir Bearing Company, New Britain, Conn.

The new Royal Precision LGP-30 is a serial, single address, fixed point binary, stored program digital computer featuring simplified design and ease of operation. The unit is designed to make computer use economical and simple enough for more widespread application.

Fafnir Super-Precision Type Ball Bearings are used in duplex pairs, mounted back-to-back, at the pulley end of the LGP-30 memory drum, and singly at the opposite end. These preloaded, angular-contact bearings, equipped with composition or bronze retainers, are widely used in precision-built mechanisms.

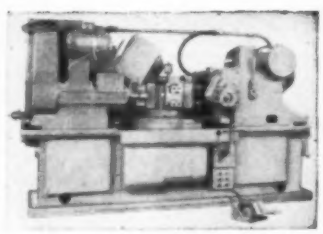
FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA

...and parts are finished without rehandling on

GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.



A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY - PRODUCT - QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

21 '58, p122) under the heading, "Aluminum oxide tools" on page 124, you stated that the ceramic tools were developed by Professor Werner Osenberg and manufactured by Blisterfeld & Stolting, Raderormwold (correctly Biesterfeld & Stolting, Radevormwald).

Concerning the name of this firm, the statement does not correspond to the facts.

The ceramic tools were developed by Professor Osenberg. However, the manufacturer of the tools was Hescho Hermsdorf-Schomburg-Isolatorengesellschaft, a branch of Porzellanfabrik Kahla, Hermsdorf, Thuringia. The tools were sold by Kerb-Konus-Gesellschaft Dr Carl Eibes & Co, Schnaittenbach, Oberpfalz, which exhibited them first at the Fair of Leipzig, 1937.

I beg you to rectify this error in the next issue.

W Osenberg
Technische Hochschule Hanover

We are sorry about these typographical errors and are very happy to make the correction—Ed.

Back issues

A complete file of back issues of American Machinist *from 1941 to date is offered for sale by a reader in Southern California. The best offer from any readers interested in this file will be passed along to him*—Ed.

Helpful Henry

by L. Hoppes

"I'll get this loose raveling for you,—Oh oh!"

CALENDAR

Society of Automotive Engineers—Farm, Construction, and Industry Machinery Forum and Display, Sept 8-11, Milwaukee Auditorium, Milwaukee, Wis.

Instrument Society of America—Annual Instrument-Automation Conference and Exhibit, Sept 15-19, Convention Hall, Philadelphia, Penna.

Pressed Metal Institute—Annual Meeting, Sept 28-Oct 2, The Cloisters, Sea Island, Ga.

Society of Automotive Engineers—Aeronautic Meeting and Display, Sept 29-Oct 3, Ambassador Hotel, Los Angeles, Calif.

American Society of Tool Engineers — Semi-annual Meeting and Western Tool Show, Sept 29-Oct 3, Shrine Exposition Hall and Statler Hotel, Los Angeles.

American Society of Mechanical Engineers and American Society of Lubrication Engineers—Lubrication Conference, Oct 14-16, Statler Hotel, Los Angeles.

Society of Industrial Packaging & Materials Handling Engineers—Annual Meeting and Exposition, Oct 14-16, Chicago Coliseum, Chicago, Ill.

American Machine Tool Distributors Association—Annual Meeting, Oct 16-17, The Sheraton Plaza, Boston, Mass.

Magnesium Association — Fall Meeting and Exhibit, Oct 16-17, Fort Shelby Hotel, Detroit, Mich.

Metal Treating Institute—Annual Meeting, Oct 17-19, Sheraton Hotel, Philadelphia, Penna.

American Gear Manufacturers Association—Semiannual Meeting, Oct 26-29, Edgewater Beach Hotel, Chicago, Ill.

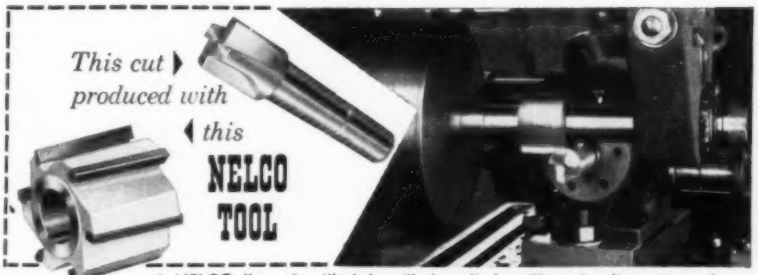
American Institute of Mining, Metallurgical & Petroleum Engineers—Fall Meeting, Institute of Metals Div, Oct 27-31, Carter Hotel, Cleveland, Ohio.

American Society for Metals—National Metal Exposition and Congress, Oct 27-31, Public Auditorium, Cleveland, Ohio.

HOW MAKE NELCO TOOLS NELCO TOOLS

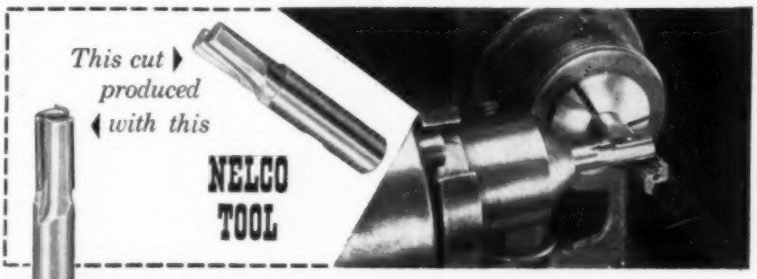
Every machining operation on over 700 different NELCO TOOLS is performed more efficiently with a NELCO TOOL!

WHY?...because the versatility, machining speed, superior surface finish and dependability of NELCO TOOLS produce finer tools, more economically.



A NELCO "standard" slab mill dry climb milling the flutes in a 4 flute, 1½" diameter NELCO End Mill. Power feed, 10½" per minute at 600 RPM.

A NELCO "standard" 3" side mill dry conventional milling the flutes in a 2 flute ½" diameter NELCO End Mill. Hand feed at 640 RPM.



A NELCO "standard" 3 flute end mill dry conventional milling the carbide tip seats in a 2 flute ½" diameter NELCO End Mill. Hand feed at 2100 RPM.

These are but three of the hundreds of milling, turning, boring, reaming operations involved in producing over 700 "standard" NELCO TOOLS.

SEND TODAY for the new NELCO Catalog showing over 700 different "standard" carbide and carbide tipped tools. Write:—
Cutting Tool Division, Brown & Sharpe Mfg. Co., Manchester, Conn.

NELCO TOOLS *For that EXTRA Edge in Production!*

CUTTING TOOL DIVISION

NELCO CARBIDE TOOLS B·S HIGH SPEED STEEL CUTTERS

PRECISION TOOLS AND GAGES • MILLING GRINDING AND SCREW MACHINES
MACHINE TOOL ACCESSORIES • PUMPS AND HYDRAULIC PRODUCTS

CIRCLE 231 READER SERVICE CARD

Are your lathes designed to profit from throwaway insert tools?

PROFIT POINT TURNING

Real profits come from decreased tool-change downtime and increased machine speeds

You can take full advantage of the savings made possible by throwaway insert tooling — elimination of sharpening and resetting costs, and decreased tool-change downtime — if you have a modern, high-speed lathe designed for carbides and ceramics. Chances are savings in tool-replacement costs plus greater production due to higher speeds and increased rigidity will amount to thousands of dollars a year, enough to pay for the new lathes you need badly to take full profit advantage.

The use of conventional speeds with throwaway insert tools is *wasteful*. And your profits are pegged *low* if you're using them on 20-year-old lathes that are underpowered for high-velocity turning. With perishable-tool costs so low in comparison with the cost of operating a lathe, the only sensible thing to do is boost machine speeds . . . burn up the cutting tool faster . . . really trim the fat out of the part price.

The speed at which tool costs and machining costs are in balance is your PROFIT POINT (see example above). But to operate at the right speed you need power, precision, and rigidity in lathes used with throwaway insert tooling—advantages your company will be glad to pay for in order to save time, floor space, and cost.

In other words, why put throwaway insert tooling on a "throwaway profit" machine tool?

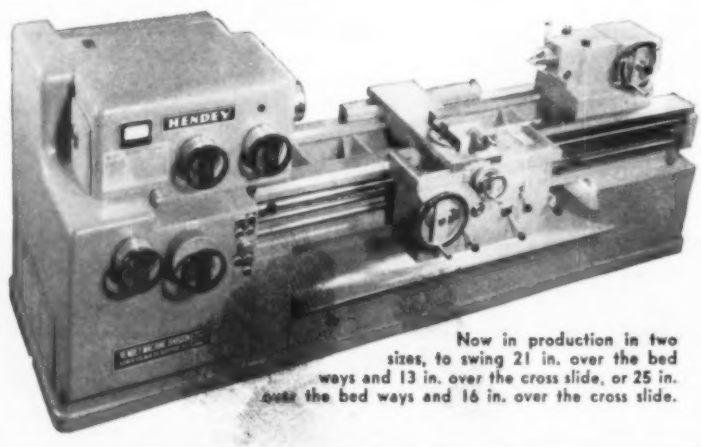
Example of PROFIT-POINT Turning		
Cost Item	Brazed Carbide	Throwaway Insert
Tool-change time	5 min.	2 min.
Cost per cutting edge	$1.27	$.25
Minimum cost tool life	40.4 min.	11 min.
Cutting speed for PROFIT-POINT turning	720 fpm 1000 rpm	980 fpm 1360 rpm
Machining time per piece	1 min.	.74 min.
Total time per piece (including nonproductive time per piece)	2 min.	1.74 min.
Machining cost per piece	$.15	$.11
Total cost per piece	$.031	$.017
Nonproductive cost per piece	$.15	$.15
Pieces machined per hour	30	34
TOTAL COST PER PIECE	$.331	$.278

Barber-Colman's new 36-speed lathe is designed for PROFIT-POINT turning

Here's the machine that will give you precision work at the high speeds required for PROFIT-POINT turning with throwaway insert tools!

Look at the cross girth of the bed, extra-heavy cross slide, and rugged tailstock. Consider that this lathe will pull up to 25 hp through the spindle and operate at speeds up to 2000 rpm — yet you can get toolroom accuracy. And all the toolroom features, too, including: (1) multiple-thread indexing spindle, (2) built-in thread-chasing dial, (3) 66 threads, from 2 to 120 per inch, (4) reverse lever on apron, (5) automatic micrometer stops, (6) ball-thread-chasing stop on cross-feed screw, (7) hardened and precision-ground cross-feed screw and compound screw, (8) automatic, filtered lubrication to half nuts.

There are 36 spindle speeds through the geared head and 66 feed and thread changes, selected easily through two dials on the headstock. Write for complete facts on how this new Barber-Colman precision lathe will pay for itself quickly with throwaway insert tooling.



Now in production in two sizes, to swing 21 in. over the bed ways and 13 in. over the cross slide, or 25 in. over the bed ways and 16 in. over the cross slide.

Barber-Colman Company
82 Loomis Street, Rockford, Illinois

Don't expect a day's work for a day's pay on yesterday's machine tools

BARBER COLMAN

PRECISION LATHES

SPOT NEWS...

- **Subcontractors are up in arms over the US's "Iron Grid,"** which they say shuts off exchange of weapons data among the nation's scientists and defense industries. "We appear to be keeping more from ourselves than from Russia," an industry spokesman says—because scientists and technicians working on separate projects can't swap data and experience without involved clearances.
- **West German industrial production has fallen off** for the first time in 10 years. This is regarded by European economists as proof the U S-born recession has reached the Continent, but German officials insist it's merely because annual holidays started earlier this year than last.
- **There's a persistent rumor in the aircraft and missile industry** that the government will run short of money to pay its bills unless the debt ceiling is raised further. Some small primes say they can't undertake any new work until the government pays existing bills. Meanwhile, major primes are wondering whether to spend only within the budget, or to commit themselves to heavier spending even if the government can't accept delivery for lack of funds.
- **Industry-financed program to split the millionth is making progress** at the National Bureau of Standards. Recent measurements to 3/10 millionth have been made, although the possibility of error is admitted.
- **Looks as though the Packard nameplate may be dropped this year** by Studebaker-Packard Corp favor of a small car similar to the Rambler. Only make that may be retained by the company is its Golden Hawk.
- **Accuracy requirements for small precision gears are getting so tight** that only matched pairs are likely to fulfil missile requirements.
- **Some Russian plants are switching from an 8 to a 7-hour working day.** Reason: new plant and equipment have upped worker output 15% in a year.
- **Can a county collect property taxes from a defense plant** operating on government property? Jefferson County, Colo, is trying to do just that—from Martin Co, Air Products Inc, and Dow Chemical—basing its claim on a Michigan ruling that Borg-Warner has to pay taxes to that state.
- **"Finest railway car building facility on this continent,"** is Canadian Car Co Ltd's claim for its expanded 1-million-sq-ft plant near Montreal.
- **"WPA philosophy" of government procurement is being rapped** by Los Angeles Chamber of Commerce. Placement of contracts in labor surplus areas, says the C of C, "is a violation of the public trust . . . to award production or supply contracts on any basis other than price, quality, ability."
- **British unions are proposing (1) a 2125-hour-per-year minimum work schedule** for members, (2) that workers with more than one year's service be kept on when business is quiet, (3) and that unions be consulted on layoffs.
- **Fringe-count micrometer for checking length of gage blocks** may soon be adapted to checking rounds, angles and holes for size and geometry. Device is based on light rays, the ultimate source of accuracy.

Spot index to major News stories...

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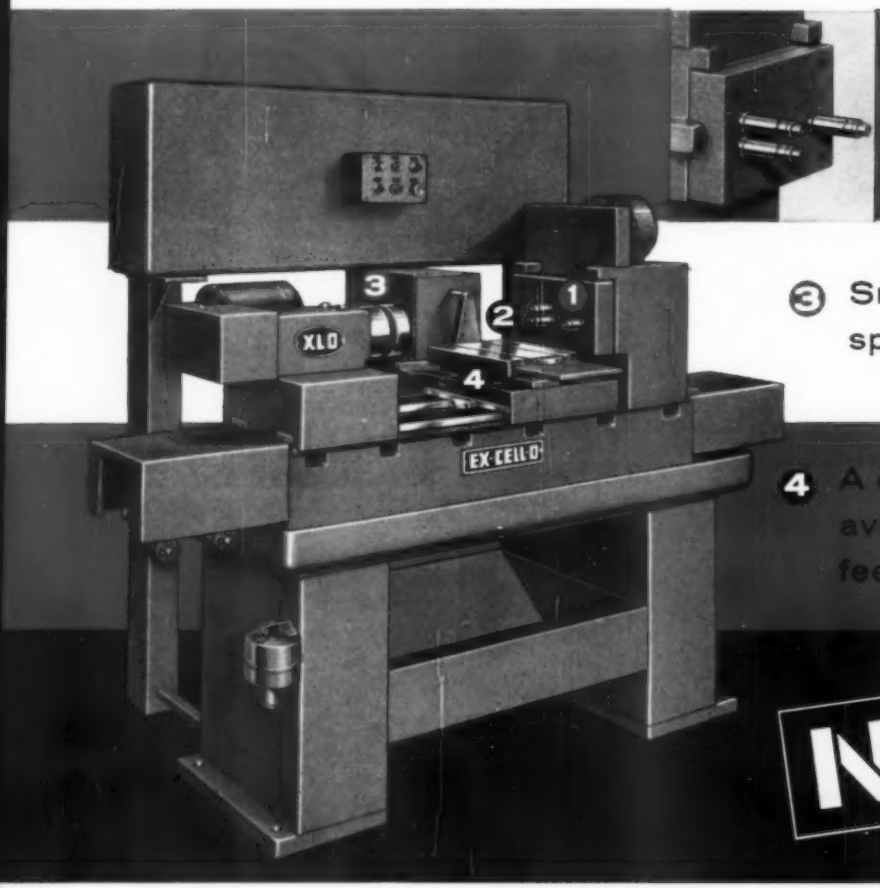
1 New Micro Spindles are as small as 3/4" dia.
...Precision Bore holes as small as 1/16"



2 Bores multiple holes at close center distances

3 Small conventional spindles can be used

4 A cross slide is available for grooving, feed facing, or indexing

NEW!

58-41

For Precision Boring of Small Components

New Ex-Cell-O Machines designed for production boring, turning, grooving, recessing, facing, counterboring and chamfering of instruments, missile parts, other precision applications.

These two new Ex-Cell-O machines put *precision* boring of aircraft, missile and automotive parts, instruments and other exacting components on a low-unit-cost production basis.

Precision-built midget spindles permit close center-distance boring and facing. Multiple holes as small as 1/16-inch can be bored with remarkable accuracy; and for maximum versatility, small conventional Ex-Cell-O Precision Spindles can also be used when required.

Compact Style 711 (single-end) and Style 712 (double-end) Precision Boring Machines have hardened and ground ways, pushbutton control, pneumatic-hydraulic table and feed control.

Optional equipment includes a mist coolant system and cross slide attachment for grooving, feed facing or indexing.

See your local Ex-Cell-O Representative or write direct.

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DETROIT 32, MICHIGAN

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MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

CIRCLE 233 READER SERVICE CARD

WASHINGTON...

Mideast crisis and arms output...

The commitment of US troops in the Mideast has put the spotlight on the venerable Washington debate over whether the US is adequately prepared to fight a brushfire or local limited war—a question raised by critics of administration defense policy over the years.

As of now, you can see no sharp turnaround in the military budget or in other key defense policies just because of the Mideast crisis. But certainly the Army and other people unhappy about past administration defense decisions will jump on the crisis as a new opportunity to argue the need for beefing up US forces to fight limited wars.

Defense Dept officials, however, knock down talk about a major reappraisal of arms production schedules at this time. They say there's nothing we can do fast enough to affect US military capability.

Defense fiscal problems?

Defense Secretary McElroy—concerned over what one of his aides calls "needless apprehensions over contract stretchouts, delayed billings, postponed contract settlements, and other financial problems in the Pentagon"—has issued an unprecedented order to the Services: Go ahead with all procurement in a "normal fashion." This includes authority to start on fiscal 1959 projects even before the appropriation mechanics have been completed. This comes on the heels of another recent McElroy order that all defense bills must be paid on time.

The Pentagon's policy line to defense contractors is this: Last year's financial squeeze will not be repeated this year. The Mideast crisis also tends to rule out this threat.

Overseas investments...

Metalworking companies interested in investing overseas should consider seeking participation of the International Finance Corp. That's the affiliate of the World Bank which makes equity investments without government guarantee in private enterprises abroad.

The Corporation is now starting to hit its stride after two years of organizing. Officials believe investments in metalworking industries are particularly suited for IFC's operations. Most recent IFC investments: $630,000 in a steel finishing plant in Pakistan, $2.4 million in expansion of Willys-Overland's Jeep manufacturing operation in Brazil.

The size of IFC's investments is less important than its role as a catalyst. The Willys deal is a good example. Total investment in the expansion program will be $22 million. American Overseas Finance Corp and Chase International Investment Corp together are putting in $1,050,000. Willys is investing $6.5 million, Brazilian investors an equal amount, and several other US firms are trading equipment for stock.

Willys is a model operation from IFC's view. It makes a useful product. It helps develop local capital markets by offering equity for local investors. With 15,000 Brazilian stockholders, it has the broadest stock distribution of any firm in Latin America.

Air Force R&D policy changes...

A plan for overhauling Air Force research and development policies has been proposed by a nine-man group of distinguished Air Force scientific advisers, headed by Dr H G Stever, the Air Force's former chief scientist, now MIT's Assistant Dean of Engineering.

The group was asked to review Air Force R&D policies right after the Soviets launched Sputnik I. Its major recommendation is for a sharp increase in R&D funds.

The group also proposes an end to "excessive administrative controls" over R&D projects and the "concentration of authority and responsibility at the working level"; a streamlining of R&D budget procedures; greater incentives in R&D contracts; greater authority for civilian personnel and "increased opportunities . . . for raising technical qualifications" of Air Force R&D personnel.

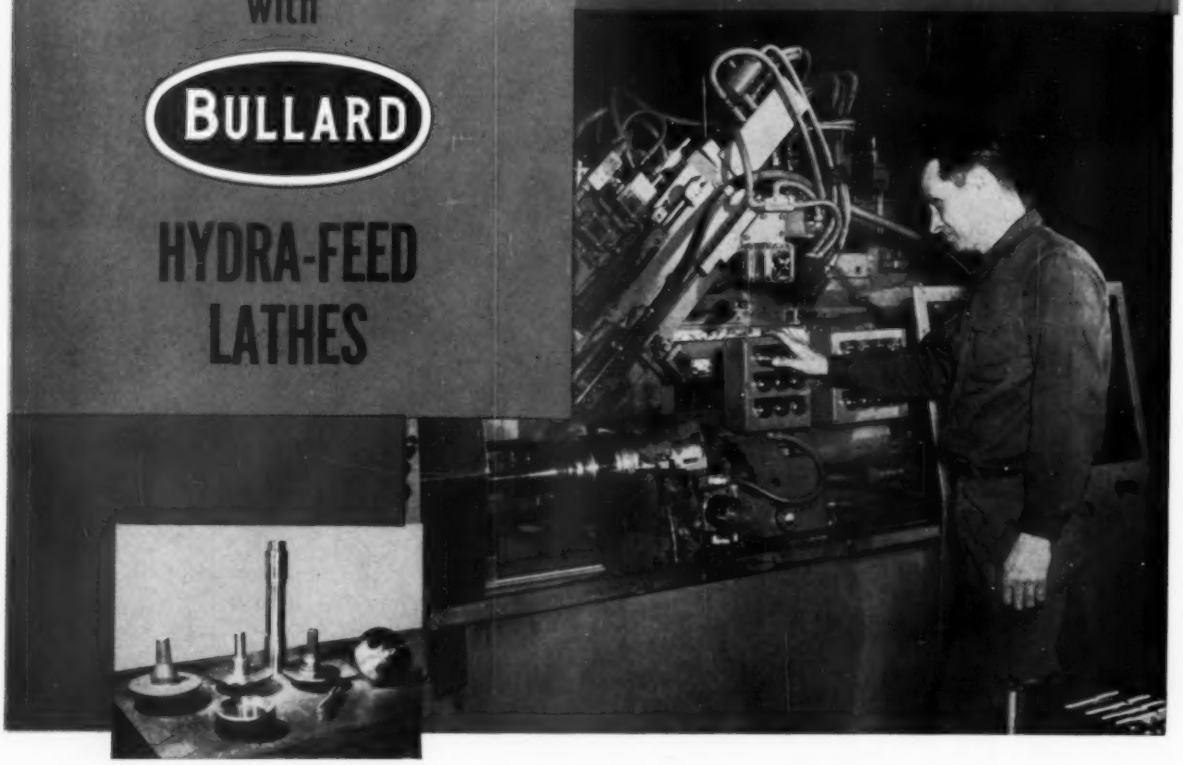
The proposal for greater incentives is being seriously considered by the Pentagon. The Air Force's scientific advisers recommended that R&D contractors be allowed fixed fees amounting to about 15% of project costs rather than the 7% allowance which military R&D contracts now average.

Patent royalties are capital gain...

The Internal Revenue Service has finally given up the attempt to hold to its longtime ruling that annual royalties paid on patent rights must be treated as ordinary income for tax purposes. IRS has just announced that it will "no longer take the position in litigation or administratively" that the mere retention of an interest resembling a royalty by the assignor or transferor of a patent "in and of itself prevents capital gain treatment."

INCREASE PROFITS by REDUCING COSTS with BULLARD HYDRA-FEED LATHES

The experience of The National Supply Company, Toledo, Ohio, manufacturers of oil field machinery, as related by Mr. Owen U. Trumbull, Tool Engineer, can be applied to improve your profit picture.



Their BULLARD HYDRA-FEED TRACER LATHE . . .

- ★ Replaced four machines previously used
- ★ Reduced machining operations from ten to four
- ★ Held work to closer tolerances
- ★ Decreased spoilage
- ★ Simplified tooling and set-up

These are all factors that have a direct bearing on profits

The BULLARD COMPANY
Bridgeport 9, Connecticut

Remember . . . to cut costs when cutting metal . . . Buy BULLARD

DETROIT...

Unseasonable changeover . . .

Buick, Oldsmobile, DeSoto, Dodge, Chrysler, and Imperial assembly plants are closed for a leisurely shift to '59 model production. These companies will be followed shortly by Pontiac and Ford's M-E-L Division. August will see most makers inactive, except Buick which plans an equally leisurely start-up on the 18th.

There is nothing in the cards, either statistical or astrological, to indicate a change from previous forecasts of a 4.3-million car year. Of the 2 million remaining to be built in the calendar year, 1.6 million will be '59 models.

Accountants for Ford, Chrysler, and Studebaker-Packard are purchasing quantities of red ink. Ford may barely not need it when year-end totals are added in. Chrysler and S-P definitely will.

GM will show a drastically reduced but still fair profit. American Motors, of course, will boast of its first (estimated at over $15 million) profit since the Hudson merger. This last higher figure is for the calendar year, not AMC's fiscal year, which ends September 30.

And so to '59 . . .

Automakers are gambling close to $1 billion on what may well be the most costly changeover in history. As we have said: Ford, Edsel, and Mercury will team up with an all-new body shell. General Motors will share a common new one throughout its line. But on the outside, interchangeability of key parts will not be apparent—each make will look totally different.

Styling theme for some smaller GM makes will be a drastically curved rear window, topped by an overhanging roof, with an effect reminiscent of the first Studebaker "Starliner" coupe design. Stylists will take considerable liberty—in a legal sense—with arrangement of the four headlights. **Pontiac and Oldsmobile, for example,** will evenly space them across the car-wide front grill. All GM windshields will curve up and over as well as around.

GM contours will be sculptured but less curved. Cadillac will have to share its fins once again, and in the case of Pontiac, pass out two for each rear fender. There will be less chrome used for its own sake, with single tones of blacks and whites expected to be the most popular colors. Shades in-between will be metallic. Chevrolet will expand its Impalla line to include a four-door hardtop.

Ford, on the other hand, will match Impalla with a special 4-door hardtop with T-Bird styling that is yet to be named. Its cars carry the George Walker styling theme so strongly that despite massive changeover expenditures, they are perhaps too reminiscent of this year's model.

Questions being asked in Detroit (for Ford, is by no means alone in its problem)—should stylists, however competent, arbitrarily be shifted between companies at least once every two years? **Chrysler products once again** carry the two body shells first introduced in 1957, but seem to have achieved an outward newness despite curtailed tooling expenditures. This company's '59 offerings will probably go down in history as the ultimate in finnyness. The projections, billed as functional from a handling standpoint, will start their rearward and outward sweep at the front door handle. The big Chrysler hemispherical-combustion-chamber engine will be dropped in favor of a bored-out version of the newer, single-rocker arm design.

American Motors will offer only slight styling refinements to its present, successful design. Studebaker-Packard will concentrate on a much shorter, economy-slanted car based on the current body shell but incorporating all-new front-and-rear sheet metal to reduce overhang—as well as a shortened wheelbase with a consequently new chassis.

The Packard and all other Studebaker models except possibly one version of the Hawk sports car will be quietly dropped. However, S-P customers will still have a choice of six V-8 engines. **In summary,** it is a year of major styling changes, few mechanical changes worth mentioning.

The small car . . .

Ford has let tooling orders (a rebuild job) for the top OHV part of its small six. Holding up work on the bottom of the cylinder block part is indecision as to whether or not a front-wheel drive will work. The company considers it necessary to compete with Chevrolet's rear engine design on the basis that unorthodoxy will garner its share of sales.

Bodywise, Ford will offer a 4-door sedan and perhaps a wagon a month after initial introduction in the fall of 1959.

Chevrolet has given up all pretense that its small car activity is destined to replace the fast-selling Holden in Australia. All engine tooling orders have been placed, the bulk of these being reworks.

GREENLEE TRANSFER MACHINES

Change with Your Requirements

THIS MACHINE HAS BEEN REWORKED FOUR TIMES

The "building block" idea of machine tool design has gained much popularity in recent years. Greenlee has long built such flexibility into their transfer machines. For example, the machine shown here has been modified 4 times in 11 years to accommodate changes in product design. Protect yourself from costly obsolescence. Ask Greenlee to show you how.

PHONE ROCKFORD, ILLINOIS 3-4881
TO HELP SOLVE YOUR PRODUCTION PROBLEMS

GREENLEE
BROS. & CO.

1727 MASON AVE.
ROCKFORD, ILLINOIS

AIRCRAFT and MISSILES... TRENDS

A & M subcontracting picks up...

The West Coast reports that aircraft and missile subcontracting is up slightly from last month, but not enough to cause any excitement. As *AM* goes to press there is as yet no noticeable effect from the Iraq crisis upon aircraft and missile output—except that here and there plants canceled anticipated layoffs for the time being.

Although the consensus is that the industry is on its way up from the bottom, defense subcontractors don't rule out the possibility that the trend could again turn downward before the year is out.

Although announced (before the mid-East crisis) employment cuts by some of the major prime contractors don't necessarily portend a drop in subcontract work, some of the small shops regard the situation warily. North American Aviation expects to drop about 3000 employees by year's end. Douglas plans to let 5000 or so go, and Northrop has indicated further austerity.

Weapons reliability study...

The House Appropriations Committee has started a secret, full-scale investigation into the reliability of ballistic missiles, supersonic aircraft, and other modern weapon systems which account for the bulk of defense production funds.

The Committee's investigating staff plans to study whether defense contractors provide adequate durability in missile components and other weapons, whether they perform sufficient testing before delivering new equipment to the Services, and the like.

A big-name group of scientists and industrialists is consulting with Congressional investigators on the project. It consists of C C Furnas, former Assistant Secretary of Defense for R&D, now university of Buffalo chancellor; Julian West of Bell Labs; the University of Michigan's Dr Harry Goode; Joseph A Chambers of Motorola Corp; Gen Leslie L Simon, retired Chief of Army Ordnance; K T Keller, former head of Chrysler Corp; and Dr W A Wildhack of the National Bureau of Standards.

"BMEWS" site postponed...

Construction of the Defense Dept's Ballistic Missile Early Warning System (BMEWS) site planned for Preswick, Scotland, is being postponed. The future of the Preswick installation—planned as one of three BMEWS sites—is very much up in the air right now.

Some Pentagon officials imply that the project is just being delayed one year, others hint it has been killed. This means at least the delay of a considerable volume of new orders for military electronic hardware.

Construction of the other two BMEWS sites—at Thule, Greenland, and Fairbanks, Alaska—is getting under way. Total cost of the two-site ballistic missile early warning system is estimated at $800 million.

Of this amount, roughly $500 million will be spent for production and installation of electronic hardware; the rest for construction.

New anti-sub missile...

The Navy is putting top priority on the new super-secret "SUBROC" anti-submarine missile. A $45-million weapon system prime contract has been awarded to Goodyear Aircraft to develop the system, including production and tooling methods. Major subcontractors on the project are Kearott Co and Librascope.

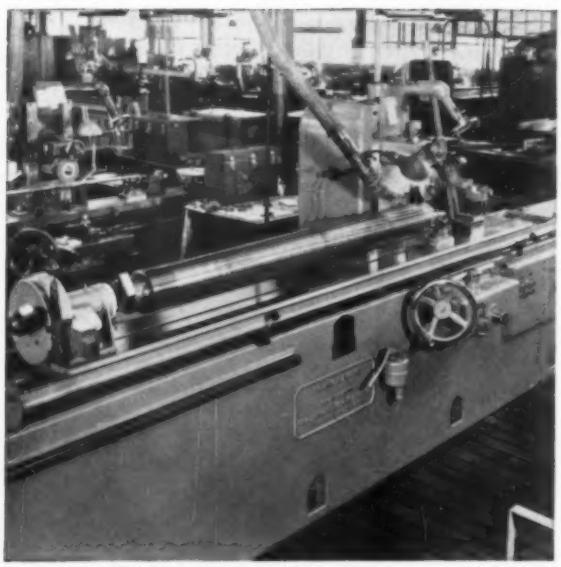
The new weapon system will be initially installed in submarines, including the new nuclear-powered Polaris IRBM vessels. It's designed to detect enemy submarines at long range, compute their course and speed, and fire the missile to destroy it. The missile will be fired from underwater, then rise to the surface, and be propelled through the air by a poewrful solid-propellant rocket to the vicinity of the enemy sub. The rocket then drops off, the nuclear warhead reenters the water and homes in on the target.

Procurement booklets...

You can now buy two important new booklets on defense production from the Superintendent of Documents, U S Government Printing Office, Washington, D C:

- **"How to Sell to Agencies** Within the Dept of Defense" (40¢) is an updated listing of who buys what in the military services—and where the procurement is handled. Also included is general background on defense procurement policies—types of procurement and contracts, instructions on bidding, and the like.
- **"Register of Planned Mobilization Producers"** ($1) lists 18,000 plants with which the Army, Navy, and Air Force have worked out war emergency production plans. The *Register* does not include items each plant is scheduled to produce. But companies listed in the *Register* can check such information on their own.

IF YOU GRIND BROACHES AND SPLINES...

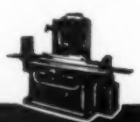


Battery of Grand Rapids Broach and Spline Grinders at Apex Broach Co., Detroit, Mich.

. . . take a cue from many of the nation's best known producers who use the only machine specifically built for broach and spline grinding. It's the Grand Rapids Broach and Spline Grinder, the only one of its kind — and the machine that offers so many features for faster, easier, big volume, high quality grinding that you'll soon see why it's preferred over machines merely adapted for broach and spline grinding.

Working surface of its table is 7″ wide x 72″, 90″ or 120″ long. Table speed is infinitely variable up to 70 fpm. Column is rugged one-piece casting. Vickers hydraulic pump with our own control valve. Separate hydraulic system for easy maintenance. Sealed-for-life spindle. And, of course, it's available engineered to your individual requirements.

May we tell you more? A note on your letterhead will bring full details.



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430 Straight Ave., N.W. Grand Rapids, Mich.

MACHINE TOOLS...

Russian competition growing...

Russian competition in world markets, particularly in the non-Communist countries, poses a real threat to western European and U S machine tool builders. It is a threat which is expected to grow rapidly as Soviet machine tool production expands the next few years.

Russia now is believed to be third in machine tool output, based on over-all physical production, and not just on numbers of machines. United States is first and Germany second.

If Russian plans work out, the Soviet Union will be in second place by 1960. Along about 1962 or 1963, the Russians hope to capture first place from the United States.

European builders told me in London and Paris early this month that they are convinced that Moscow intends to use some of its large machine tool production for economic warfare.

Terms already quoted to prospective buyers by the Russians are reported to be easy; and prices are low. Observers point out that Russia cannot possibly absorb for long all of its enormous production of certain general-purpose machine tools, despite the fact that the Kremlin has ambitious plans for expansion of industrial facilities. An outlet must be found for them elsewhere.

Russian competition in varying degrees is showing up in western Europe, India, Latin America and other parts of the world. It is not much yet, but no telling what it may be six months hence.

It is not just Russia, but her satellites that are bidding for western machine tool business. The Czechs are actively seeking orders, and getting some, in Britain as well as on the Continent. They are after business in Mexico, for one. They have two sizable display rooms in Mexico City.

June was second best month...

Net new orders for cutting-type and forming-type machine tools rose to $32 million in June, compared with $28 million in May. Though this showing is nothing to write home about, it is encouraging and makes June the second best month of the year.

For the first six months of 1958, net new orders were just under $180 million. That is only 46% of the $391 million booked in first half '57.

Shipments were off in June to $41.8 million, against $50 million during May. In the first half, shipments amounted to $303 million. They were $573 million in the January-June period in 1957.

Checkup of machine tool builders reveals a widely varying pattern of business. One important company reports June was its best month in a long time, but still only two-thirds of the total in the same month last year.

This firm has some orders on hand with long engineering lead times that won't get into the shop this year. What it needs is orders for machines requiring short lead times.

Another builder has experienced a very slow but steady pickup in sales, but its shop is running only 32 hr a week. Still another builder says that orders for both standard and special machines have been up 25% recently.

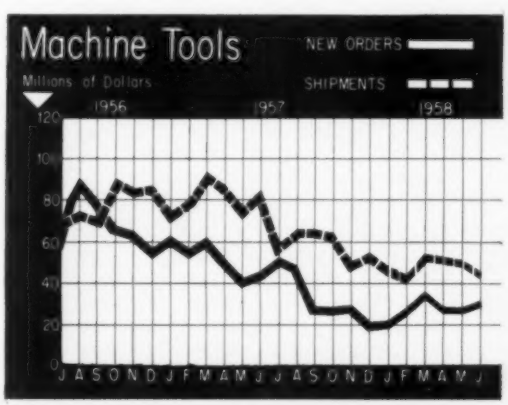
A prominent press builder reports things looking up, with June the best month of the year. July has been better than June. It is optimistic about the rest of the year because inquiries are better, foreign business has been good and promises to continue brisk, and incoming orders are from all types of customers.

One machine tool company that has been doing relatively well attributes much of its sales success to enlargement of engineering services to its customers. It has increased its staff of creative engineers for working out production setups. In a recent sale, the company put in 206 engineering hours on a line involving 18 separate operations. The final result was 10 times faster production than formerly.

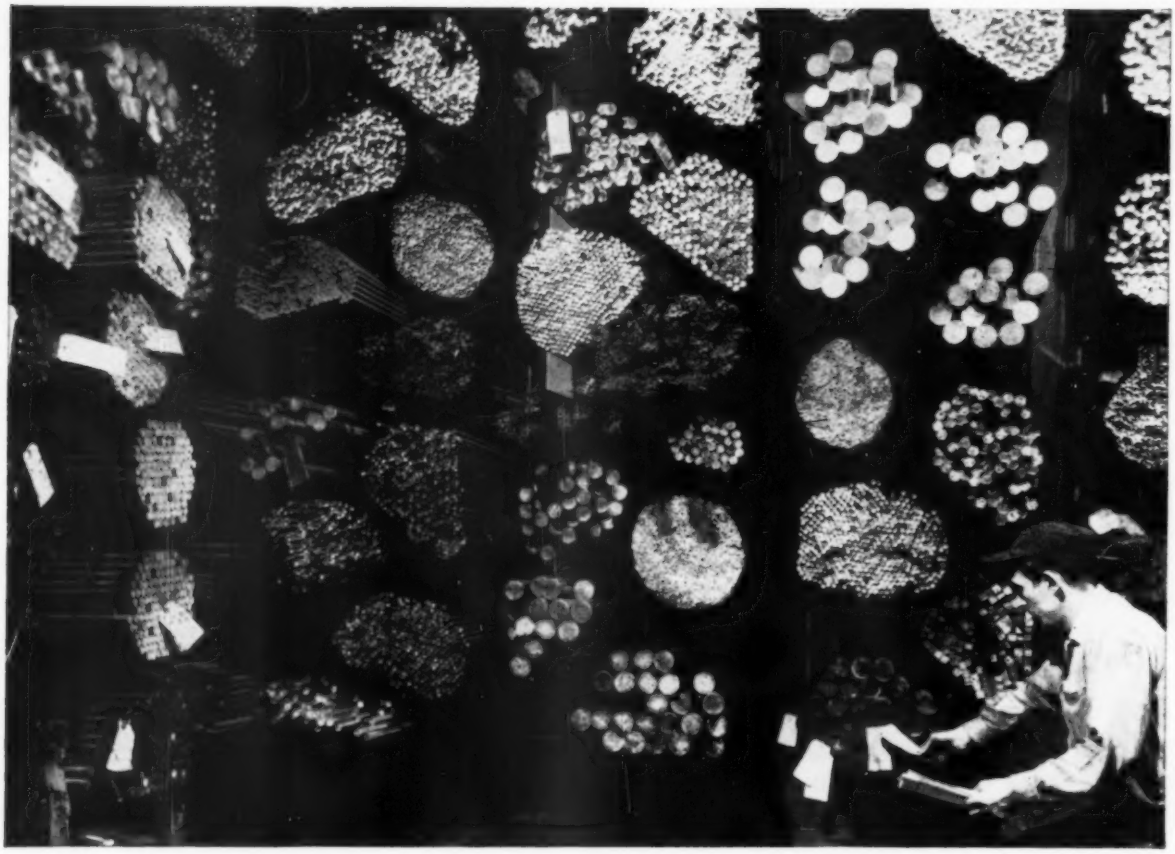
A well-known builder of standard machines has been doing a considerable amount of rebuilding of its machines to keep some of its people busy.

Both builders and distributors that have staged shows recently declare they stimulate business.

BF.



Net new orders for cutting and forming machine tools rose to $32,150,000 in June from May's $28,050,000. But at the same time, shipments dropped on the National Machine Tool Builders' Association Index from $50,350,000 in May to $41,900,000 in June



3-Point Check List

FOR USERS OF COLD FINISHED BARS

✓ ***SIZE RANGE.*** Size ranges on hand at Ryerson are second to none, even including hard-to-get intermediate sizes. Shafting . . . screw machine steel . . . accuracy stock . . . machinery steel—every type of cold finished bar awaits your call.

✓ ***Know-How.*** Every day Ryerson steel men—*specialists* in cold finished bars—are in touch with machining problems . . . latest techniques. This unequaled fund of experience is ready to serve you in selecting a steel that gives faster machining to closer tolerances . . . better finish.

✓ ***Reliability.*** Year in and year out your most reliable source for cold finished bars is Ryerson. Call today. Prompt, personal service from experienced steel men proves that Ryerson service saves you time and money on your order for a few bars—or a truckload.

Widest size range always on hand, even including hard-to-get intermediate sizes.

Shafting stock receives special care to insure protection of finish and straightness.

RYERSON CERTIFIED QUALITY

RYERSON STEEL®

Member of the INLAND® Steel Family

Principal Products: Carbon, alloy and stainless steel — bars, structurals, plates, sheets, tubing — aluminum, industrial plastics, metalworking machinery, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK · BOSTON · WALLINGFORD, CONN. · PHILADELPHIA · CHARLOTTE · CINCINNATI · CLEVELAND DETROIT · PITTSBURGH · BUFFALO · INDIANAPOLIS · CHICAGO · MILWAUKEE · ST. LOUIS · LOS ANGELES · SAN FRANCISCO · SPOKANE · SEATTLE

MATERIALS... TRENDS

Korea vs Lebanon...

In June, 1950, the U S went into Korea shooting. This meant an immediate need for tanks, planes, guns, men—and munitions. Korea was a sudden development at a time when the defense budget was at the postwar low of $13 billion and the nation was on the upswing from the '49 recession. Almost immediately materials were in short supply and prices started to zoom. Capacity was inadequate. Very quickly, manufacturers were faced with controls and rationing.

Lebanon, and the Middle Eastern crisis, finds us in a somewhat different situation. While recovery from today's recession seems imminent, we still are near the business bottom. Capacity is far from filled. Inventories are, at least, adequate. Our weapons stockpile is better in quantity and quality than in 1950. Defense spending is approaching $40 billion—triple that of eight years ago. *And the Marines did not go in shooting.*

If Lebanon triggers a full-scale "brushfire" war, shortages will develop rapidly. Military buying will increase. The consumer public will rush to buy the things that a war economy might deny them. Employment will rise. Prices will inflate. While the US is presently in the best condition since the end of WW II to provide a "guns and butter" economy for a long time, scare buying will create imbalance.

On the other hand, a limited action in which the government of Lebanon is simply helped to protect itself, as hoped for by President Eisenhower, will mean a less drastic demand—but it will increase the need for goods, nevertheless. War threats always increase demand. And regardless of the direction taken by the action in the Middle East, attitudes in the US have been jabbed to the point where bruises will be very slow to heal.

Manufacturers must plan carefully and watch closely. For almost a year many companies have been reducing inventories, working on short delivery schedules, trimming order quantities in line with actual demand—to the point where, it is expected, this fall will find inventories very low. Otherwise a healthy condition, this depletion now could prove dangerous. Markets, and the supplies to meet them, must be carefully re-evaluated in the light of these events. Shortages, and even controls, could arrive in a hurry.

Already, both the Air Force and the Army have held at least one secret meeting each, in Texas and in New York City, to discuss mobilization planning—in case the brushfire develops. Each meeting was attended by key officials from more than 100 top suppliers to the military. Details were secret, but military leaders acknowledged that materials, and supply problems, had a major place in the discussions. Other meetings are planned.

New future for foil...

If you're in the wire business, look out! Some newly developed techniques in the application of aluminum and copper foils, particularly the latter, to coil making, show exceptional promise. Copper foil has made some progress in recent years as a printed-circuit material. Now, new component designs and manufacturing equipment make possible the use of copper foil to wind small transformers, fractional-horse-power motors, relays, solenoids, servomechanisms, etc. One sizable potential use is in automotive electrical systems; appliances offer a variety of places to include this material. Preliminary uses may be small—but the idea is basic. Copper foil has two forms: electrolytic and rolled. For this use, rolled copper appears to be far the better of the two.

Encapsulated motors...

By completely casting open-type motor stators in an epoxy resin, Allis-Chalmers Mfg Co has added a motor to its Super-Seal line that provides complete protection for the insulation system. Encapsulated insulation systems can be used where moisture or contaminated atmospheres could destroy the effectiveness of conventional insulation, previously protected by special enclosures. The epoxy system offers a sizable saving in initial motor investment.

New metals supplier...

Production Steel Co of Detroit announces a $5 million expansion program, including a new subsidiary, Production Steel Products, Inc. Renovation of existing facilities includes a long-inactive, 80,000-sq-ft plant to house the new subsidiary, plus a 100,000-sq-ft addition of outside space to Production Steel's main plant. New facilities will shear, saw, burn, edge, decoil, roller level, skin roll, slit, pickle, and degrease steel. The new division will stock a $3¾-million inventory of hot-rolled bars and shapes, cold-finished bars, structurals, plates and galvanized steel. The company will also represent Crucible Steel in its stainless steel line and Olin Matheson Aluminum.

CIRCLE 238 READER SERVICE CARD

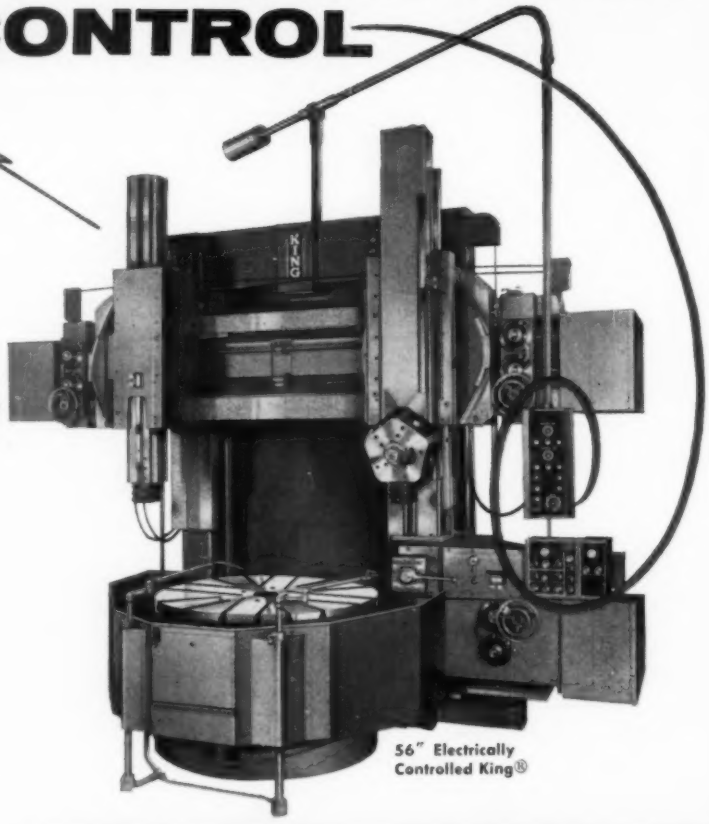
FULL ELECTRICAL CONTROL

...and other outstanding features for

FASTER, BETTER, LOWER COST Boring, Facing, and Turning

with the ALL-NEW

KING



56" Electrically Controlled King®

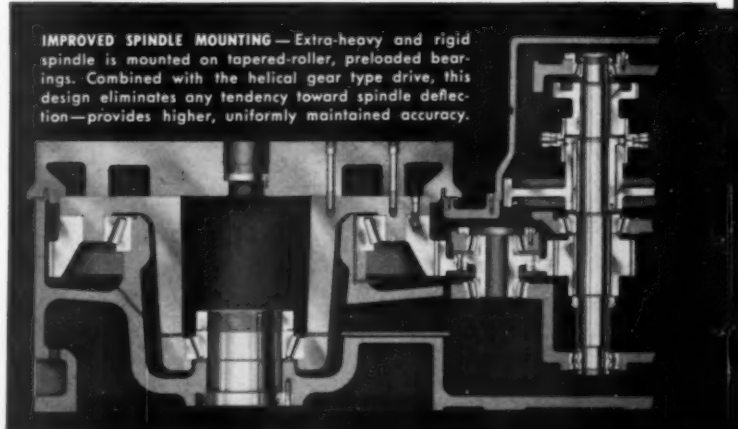
Here is boring mill control manipulation cut to a bare minimum . . . all controls *electrical* . . . all controls literally at the operator's *fingertips!*

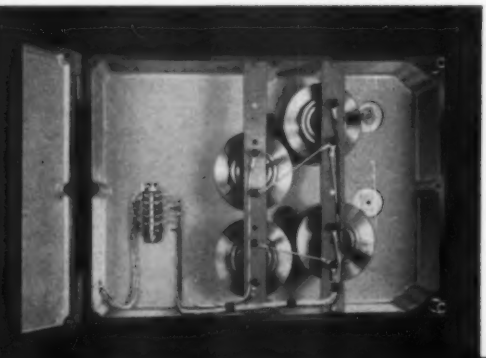
On these new KING® Vertical Boring & Turning Machines, direction of head movements is by simplified "up-down" and "in-out" switches; spindle speeds and feeds—both in expanded ranges—are pre-selective from direct-reading dials. The new KING is huskier and more powerful, too. Increased machine rigidity and higher horsepowers take *full advantage* of the capabilities of modern cutting tools.

The new KING will bring to your operation, as it is bringing to so many others, all-important competitive advantages in faster set-up . . . faster operation . . . higher, uniformly maintained accuracy . . . greatly increased productivity . . . *profit-making performance.*

For complete details see your authorized King Distributor, or write us direct.

IMPROVED SPINDLE MOUNTING—Extra-heavy and rigid spindle is mounted on tapered-roller, preloaded bearings. Combined with the helical gear type drive, this design eliminates any tendency toward spindle deflection—provides higher, uniformly maintained accuracy.





MAGNETIC-CLUTCH TRANSMISSION for feed rods. Pushbutton operated. Instantaneous engagement and disengagement of feeds assured. No periodic adjustment needed . . . clutches are easily removed for maintenance.

UNIT CONSTRUCTION OF DRIVE Extra-rugged housing provides increased rigidity for mounting of shafts. Heat-treated alloy gears, and shafts mounted in anti-friction bearings, used throughout. Drive removable as a unit for easy maintenance.

KING VERTICAL BORING & TURNING MACHINES

American Steel Foundries
KING MACHINE TOOL DIVISION
1150 Tennessee Avenue, Cincinnati 29, Ohio

WHAT'S AHEAD... in Metalworking

TRENDS

Mideast crisis could bolster metalworking . . .

The Middle East crisis is likely to have the effect of halting any further decline in metal working production in general.

With a war threat hanging over the country, demand promises to rise at least a little, and perhaps considerably. Both industry and consumers will purchase commodities that they feel may become hard to get and will be higher priced later on. At least a mild lift for metalworking is a reasonable expectation.

But even the threat of war won't produce an all-out let-the-chips-fall-where-they-may war production effort as it did at the beginning of Korea. **Reason is that America today** is much better supplied with the materials of war than it was just before Korea, when the defense budget was at a postwar low of $13 billion. Today's defense spending is at the highest in peacetime history —around $40 billion a year.

And there is plant capacity to produce almost anything the nation needs in the way of arms. **But even though the U S could carry** on a shooting war with what it has for quite a while, military equipment must be replaced, and that alone would be enough to boost the economy sharply within months.

Autos are the big question . . .

By now the 1958 model year has been pretty well written off as a poor one by the automotive industry. Long summer vacation shutdowns and changeovers aren't helping the situation, either.

Much will depend upon the public's acceptance of the forthcoming 1959 models this fall. If the '59s were really to catch on, the auto-dependent Midwest would get a tremendous economic lift. The Great Lakes metalworking centers, because of this same dependency upon the automotive industry, aren't coming out of the recession as fast as the rest of the country.

But industry officials and steel people, while they expect a definite pickup with the advent of the '59 models, don't expect any rocket like burst of sales that would pull the whole economy up with it.

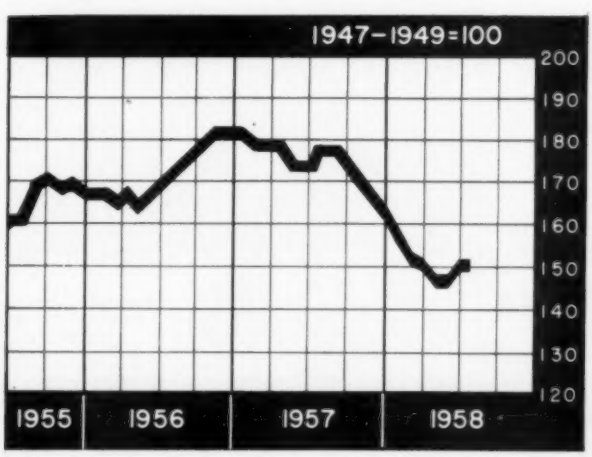
Appliance outlook has brightened considerably over the last few weeks. Inventory liquidation is responsible, and industry officials are certain that the upturn in appliance sales and production, while it isn't spectacular, will continue well into next year at the very least.

Producers of major appliances now estimate that from here on out until fall business will stay at 1957 levels, then will pick up at a more rapid pace, compensating for first-of-the-year drops to the point where 1958 will wind up just about even with 1957.

New orders for production tools, equipment and supplies—generally one of the most reliable indicators of the metalworking business climate—have turned up for the first time in eight months.

Steel warehousemen, who can generally be relied upon as industrial barometers, see a "very modest" increase in use of hot-rolled steel for the rest of the year. But for cold-rolled steel sales they expect a fast, sharp increase in the fourth quarter.

Stainless steel sales look good, too. They turned up in June and are expected to show another 10 to 15% rise over the next 6 to 8 months.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

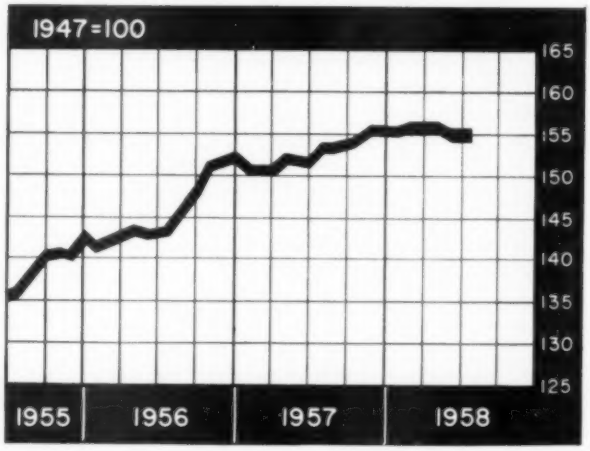
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JULY Estimated	JUNE Preliminary	MAY Revised	JUNE Year Ago
Total Index	**151**	**151**	**148**	**177**
Machinery	**125**		**123**	**151**
Electrical Machinery	**174**		**167**	**210**
Autos	**89**		**90**	**120**
Other Transportation	**350**		**340**	**376**
Other Metalworking	**131**		**126**	**145**

TRENDS WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	JULY Estimated	JUNE Preliminary	MAY Revised	JUNE Year Ago
Total Index	**155.9**	**155.9**	**155.8**	**151.9**
Metalworking Machinery		**181.1**	**181.1**	**176.9**
Other Machinery exc. Electrical		**166.0**	**165.8**	**160.8**
Electrical Machinery		**158.8**	**158.5**	**154.3**
Fabricated Metal Products		**146.3**	**146.4**	**143.2**



Employment outlook is improving . . .

Unemployment rose to 5.4 million in June. But more important, non-farm employment also increased, registering its second successive more than seasonal gain. Non agricultural employment stood at 50.4 million in June—4% lower than the year before but 1.4% above the low in March.

The most striking development in the June employment picture occurred in manufacturing. Factory employment, seasonally adjusted, increased from May to June after declining steadily for a year and a half. Improvement took place in durable as well as non-durable goods manufacturing. The only durables industries where sizeable employment declines were recorded in June were non-electrical machinery and transportation equipment, reflecting the still depressed state of capital spending.

June also saw an unusually sharp gain in the length of the factory work week. Average hours worked jumped from 38.6 in May to 39.2 last month. Overtime hours also picked up. Thus not only were more factory workers employed in June but those on the job worked longer hours. As a result, average weekly earnings shot up to $83.10, highest since 1956.

Employment gained in all other sectors of the economy, too, with the exception of state and local government. And the drop here—less than 1%—was due to vacations for teachers.

The biggest increase in employment came in contract construction, 155,000 more workers were on the payrolls in June than in May. It was the fourth straight month construction employment had improved.

Employment has doubtless fallen off some this month, as it always does from June to July. Nevertheless, the most recent job statistics indicate the economy is in the incipient stage of recovery.

QUARTERLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	132.4	130.1	144.3
Steel ingot operation (thousands of tons)	1,515	1,442	2,030
Electric power output (million Kilowatt hours)	11,851	11,210	11,964
Production of automobiles and trucks	98,040	46,206	143,699
Engineering construction awards (Eng. News-Record—millions)	$733.0	$559.0	$386.4

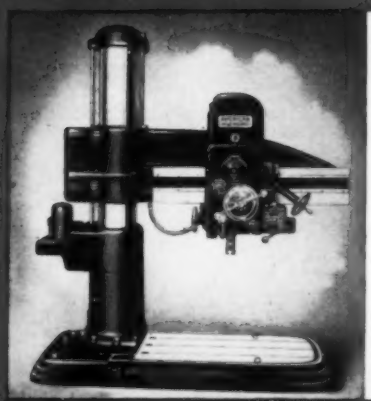
MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	130	128	145
Index of durable manufactures production (1947-1949=100)*	138	134	163
Durable goods manufacturers' sales, millions*	$11,668	$11,532	$14,296
Machinery manufacturers' sales, millions*	$ 3,714	$ 3,748	$ 4,354
Durable goods manufacturers' new orders, millions	$11,292	$10,833	$14,115
Machinery manufacturers' new orders, millions	$ 3,664	$ 3,596	$ 4,321

* Seasonally adjusted

?

Are you really putting your small radial drills to work...OR... are they just drilling machines



If they are "AMERICAN" Hole Wizards they are DRILLING...TAPPING and BORING MACHINES

...not just radial drills!

To further improve their boring qualities the new "AMERICAN" 9 inch and 11 inch column Hole Wizards now may be equipped with a FINE FEED BORING ATTACHMENT.

This attachment, furnished in addition to the standard feeding mechanism, merely by the flip of a lever reduces the standard feed range 75 per cent.

The fine boring feeds thus provided are the answer to precision boring on radial drills. Many tool and die shops are already using them for high precision, fine finish boring of jigs and fixtures.

And don't overlook the advantages of the Hole Wizard's Helical Gear—Lo-Hung Spindle Drive —NITRIDED SPINDLE AND SLEEVE—TIMKEN MOUNTED WITH OUTSIDE ADJUSTMENT FOR SPINDLE BEARINGS.

These exclusive "AMERICAN" features permit putting your radial drills to work at a profit.

- ***Ask for bulletin No. 325 and get all the facts.***

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U.S.A.

LATHES AND RADIAL DRILLS

CIRCLE 239 READER SERVICE CARD

HARD GEAR HONING

CURRENT RESULTS

The following records are taken from current gear honing operations to show how some of the troublesome hazards of gear manufacturing are overcome by honing.

WHAT HONING ACCOMPLISHED

GEAR "A"

A lead error of .0008" was reduced to .0001"

GEAR "B"

Runout was improved .0020"

GEAR "C"

Notable improvement in both surface finish and in amount of tooth kickout

GEAR "D"

Variation in involute form improved .0002"

GEAR "E"

Size over pins reduced .004" and all nicks removed. Essentially a salvage job

THESE ARE THE GEARS BEING HONED

Gear	No. Teeth	Pitch Dia.	Rockwell "C"	Stock Removed	TIME	
					Honing	Floor to Floor
"A" INTERNAL	83	5.7832	58-63	.0015	40 sec.	70 sec.
"B" PLANET PINION	15	.790	56	.0005	27 sec.	31 sec.
"C" REAR SUN GEAR	45	2.3726	54	.0006	30 sec.	34 sec.
"D" REAR SUN GEAR	45	2.508	58	.001	24 sec.	30 sec.
"E" SPUR GEAR	46	6.000	60	.004		3 min. 25 sec.

NOTE: Hone Life, Gear "B"—6000 to 8500 pieces
Gear "C"—3000 to 4000 pieces

Write for Bulletin H-57-2

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING, GEAR HONING AND ELLIPTOID

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

8098

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Heading Straight For Trouble

Firmness of prices is a phenomenon of the current recession. Prices, in fact, have gone up rather than down during a prolonged period of lethargic demand.

This reversal of the usual procedure in slack times is not accidental. It is not even surprising. It stems directly from the continuing high level of wages in the manufacturing and in the service industries.

The downturn in business has not halted the upward march of wage rates. Take the steel industry. A long-term labor contract called for automatic increases on July 1. The union insisted upon putting them into effect, despite the low state of the steel market.

While a stalemate still holds . . .

at Detroit, it is a foregone conclusion that the automobile industry eventually will grant some kind of an increase to its workers, even during one of its poor years. What the automobile makers do is likely to set the pattern for all of Metalworking.

With this sort of upward spiral at work, no wonder prices have not caved in, as they have in previous recessions. Manufacturers would be courting trouble, even disaster in some cases, if they yielded to the temptation to slash prices vigorously to get orders. Their labor costs do not permit such actions.

A grave responsibility . . .

All of this serves as a sharp reminder that union leaders, as well as industry, have a grave responsibility to the American people. That responsibility is to stay within the bounds of reason and not to force settlements that lead inevitably to economic difficulties.

The point is that if wage rates are raised, the increase must be compensated for by higher productivity. If higher productivity is not forthcoming, the new wage rates are contributing directly to higher costs, higher prices and ultimately to inflation.

No one yet has discovered a magic formula for raising productivity. More than that, the only known national indexes of productivity show that gains have not been uniform year after year. Losses have occurred in some years.

Productivity is hard to measure . . .

except in a broad way. It is especially difficult to pinpoint in a particular company, the result being that national indexes are resorted to.

There is little doubt that productivity has failed to keep up with the continuous and steep climb of wage rates. Westinghouse, for one, figures that in the past ten years its employees' straight-time benefits have gone up 65%. In the same period, national productivity has risen only 28%.

Westinghouse men and women thus have received wage increases greatly exceeding the average national increase in the rate of productivity. Other metalwork manufacturers have had the same experience.

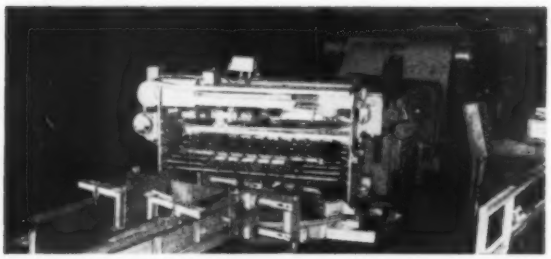
Improved machines . . .

and new production techniques, incidentally, have been largely responsible for better productivity. Employees have had less, not more, physical labor to do.

All of us should keep constantly in mind one cardinal point: If wages should continue to go up faster than productivity, our economy is heading straight for trouble. The resulting inflation will be troublesome, repugnant and costly to the rank and file of workers, to management and to the American people.

Burnham Finney EDITOR

Cincinnati Shear swivels for mitre cuts at Budd



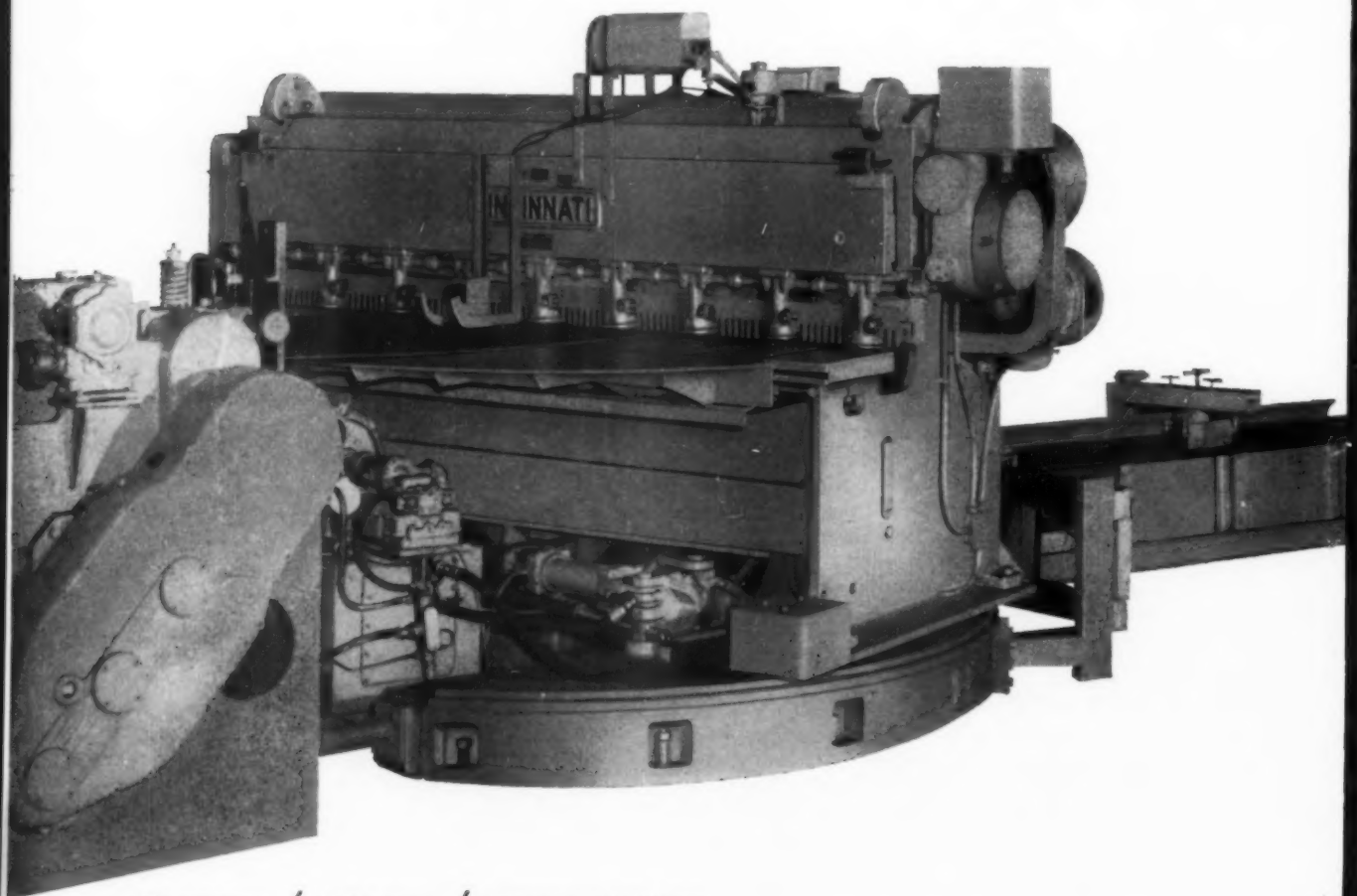
This Cincinnati Shear is an integral part of an automatic decoil and shear line at The Budd Company's Gary, Ind., plant. It is used for straight and mitre shearing of coil stock into sheets.

Mounted on a swiveling base, the shear can be rotated 22½° to either side of center, so the operator can pre-set the desired angle of cut.

Accuracy must be within ⅛″ per 80″ of feed. Sheet widths range from 24″ to 72″ and thickness from 21 to 16 gauge (.0349″ to .0625″). Since the operation must be automatic and continuous to be economical, Cincinnati dependability is a vital asset.

This shear was specially engineered for The Budd Company. However, most of its profitable features are available with standard Cincinnati Shears. They include powerful hydraulic hold-downs, all-steel interlocked construction, and one-clearance shearing of different metal thicknesses.

Complete details on Cincinnati All-Steel Shears are included in Catalog S-7R. Write to Dept. A.



Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO. Cincinnati 11, Ohio, U.S.A.

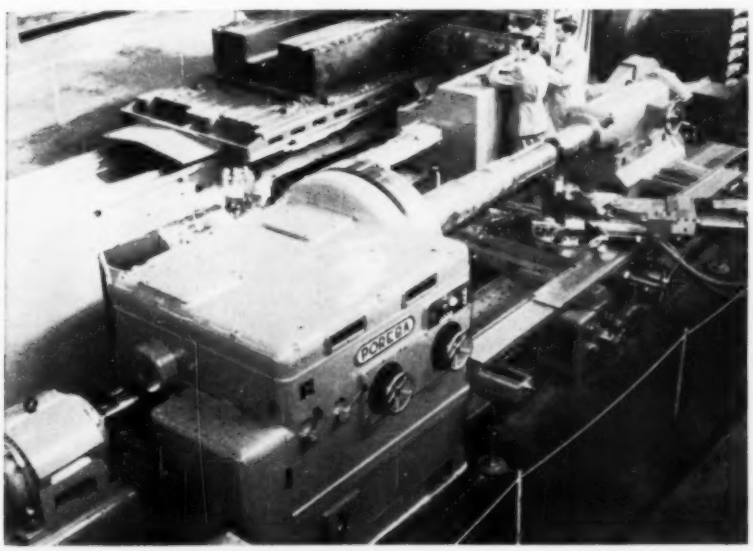
CIRCLE 241 READER SERVICE CARD

Something like 25 machine tool plants gave evidence of Poland's emergence from centuries of agrarianism as they exhibited their new developments at Poznan Fair. But they had precious little help from the USSR, preoccupied with its showing at Brussels, or from other Communist satellites, each of which is eyeing the other's industrial ascendancy, jealously. Nevertheless . . .

Poland comes of industrial age at Poznan Fair

POZNAN, POLAND—A Polish show for Polish buyers is just about the way this year's Poznan Fair could be characterized—yet it marked for the first time the transition of Poland from a primarily agrarian nation to a producer of industrial goods. Too, it marked Poland's first major bid for machine tool exports, even though something like 95% of all inquiries at Poznan came from Polish industries themselves.

Of particular significance at Poznan was West Germany's domination of the foreign pavilions, an indication that Germany plans to return in force to the Eastern Market. Germany's exhibit exceeded the combined efforts of the United States, the United Kingdom and Soviet Russia. The latter, presumably preoccupied with its industrial showing against the West at Brussels Fair, showed a relative indifference toward the Poznan Fair which could well stem from Poland's ambiguous position in the Soviet Bloc.



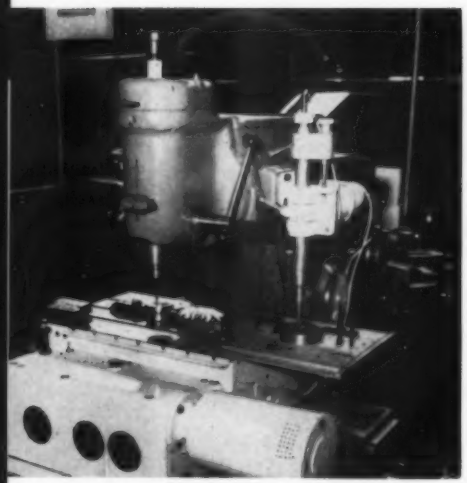
Biggest Polish lathe shown at Poznan . . .
. . . was a 25-tonner fitted with a copy-turning attachment. Tracer mechanism following front-mounted templet is hydraulic. Initial positioning of tool slide is regulated by lead screws. Machine is designed for roughing and finishing, facing, boring, taper turning, and thread-cutting with steel or carbide tipped tools. Swing over bed is 1250 mm, center distance extendable from 3 to 15 meters. Twenty-four speeds range from 1.12 to 224 rpm

Satellite Showing Poor

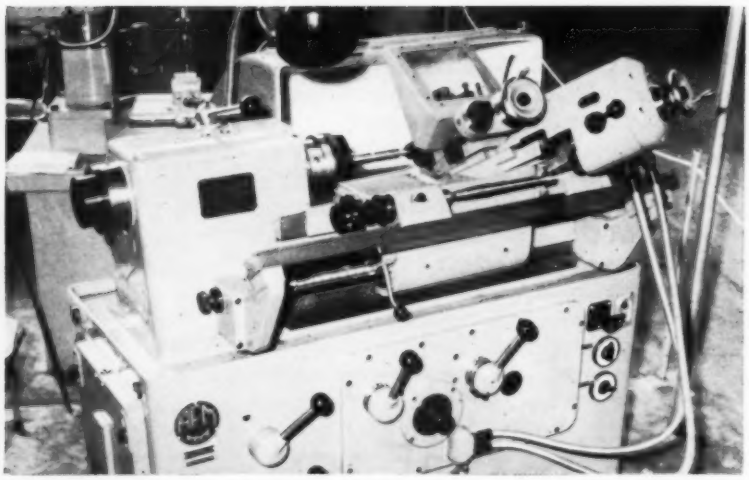
Other Communist satellites made a poor showing at Poznan probably because of mutual jealousies between them. It was even noted that Eastern Germany made access to Poznan as difficult as possible. Czechoslovakia's exhibit, like that of East Germany, was a mere token affair, while China and Bulgaria showed small groups of tools that have all the earmarks of traveling from one exhibit to the other in Eastern Europe indefinitely.

France and the United States showed only woodworking tools and textile machinery. Britain's exhibition resembled nothing so much as a congested bargain basement, cluttered up with about 50 products of various kinds—an atmosphere in which it would have been almost impossible to display machine tools to any effect.

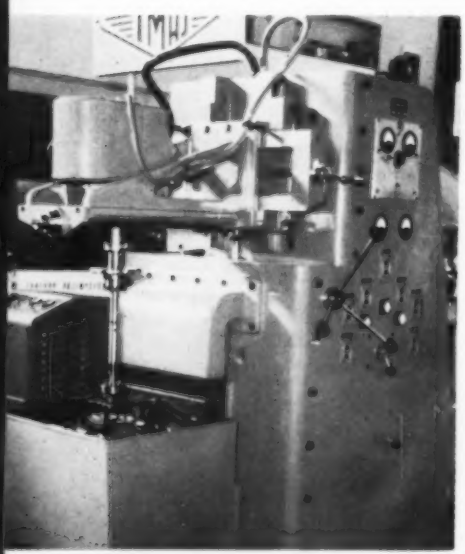
Poland, which today produces



Spark-copying attachment . . .
. . . on small universal miller can trace from model made of soap, or even from a flower petal. Low-voltage, low-frequency potential applied across tracing finger and moist model creates spark of 25-30 microns between the two without physical contact. Minute changes in resistance of arc regulate vertical travel of table through a magnetic clutch. Accuracy is to ±10 microns. Max vertical movement for 3-D milling is 55 mm



Small Polish copy lathe . . .
. . . with 100-mm swing and 375-mm center distance is designed for fast production cycles. Machine features a treadle-operated hydraulic tailstock and a center-point chuck with work gripped by three serrated pawls. Hydraulic tracer mechanism and master are placed in front for easy access and changeover. Swarf bin at rear is standard equipment. Eight spindle speeds range from 350 to 4000 rpm



Spark eroder . . .
. . . first ever produced in Poland and under development for four years, has maximum work area of 15,000 sq mm, and a cutting speed of 400 cu mm per min. Cycling is semi-automatic—the 350 x 500 mm table and oil bath descend after electrode has penetrated to predetermined depth. Smaller model for removing broken tools was shown

something like 300 types of machine tools, displayed its latest models at Poznan in individual stands bearing the names of the factories. In addition to refined versions of standard lathes, planers and grinders, Polish makers showed several advanced machines: spark-erosion equipment, a high-frequency unit with automatic cycling for induction hardening of individual teeth of large gears, a lathe-type miller for descaling square-section steel ingots, and a universal miller fitted with a spark-copying attachment sensitive enough to trace the petals of a flower.

One Polish trend notable at Poznan is a growth of specialization in various Polish machine tool plants—an effort to consolidate design and increase production efficiency. For instance: an improved range of horizontal, vertical and universal millers shares such common subassemblies as column, knee, table, drive mechanism.

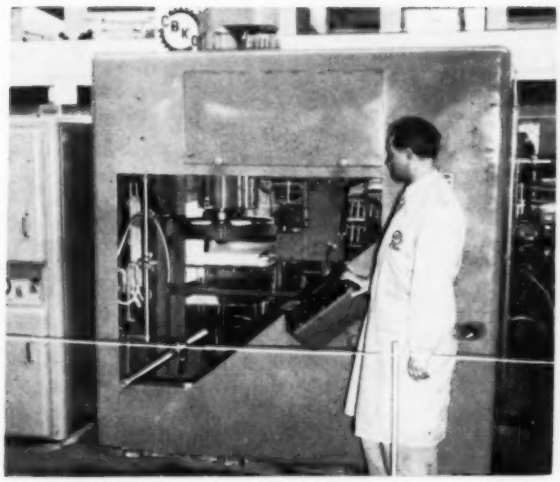
External finish of most Polish machines was of a high order. It is clear from this that the Poles are making a major effort to bring their equipment up to international standard. Prospective Western buyers found Polish prices favorable. Up until now, Poland's industry has been hampered by uneconomic methods, by high material and internal transport prices. But Poland has lately made a concerted and apparently successful drive to overcome these drawbacks.

West Germany dominated the foreign pavilions through an organization of German machine tool builders set up expressly to coordinate its display at Poznan. Germany's display showed remarkable industrial and commercial aggressiveness, was particularly noticeable in contrast to the lackadaisical attitude of competing nations, excepting the Swiss, who concentrated their entire industrial effort upon machine tools.

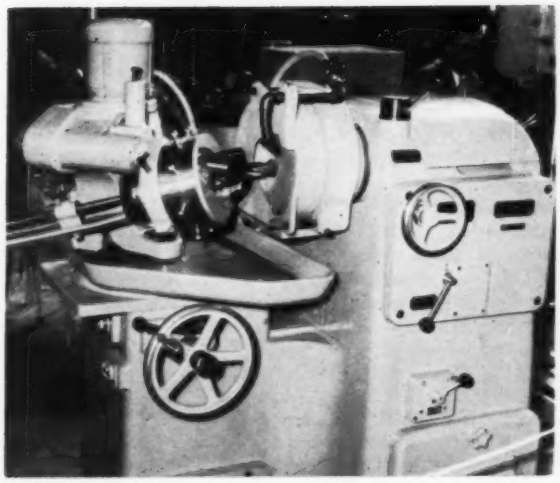
Big German Makers on Hand

German exhibitors included Gildemeister (three automatics), Klingelnberg (six types of gear hobbers), Ludwig Loewe (copying lathe, vertical miller, universal grinder and optical profile grinder), Max Muller (single spindle production lathes and special machines), Schwabische Huttenwerke (vertical miller), Traub (five automatics), Fromag (keyway drawing frames) and Vollmerwerke (automatic presses).

Switzerland was represented by Essa, Kombi-Schliff, Lambert, Perrin, Schaublin, Tarex and Tornos. Tavannes showed a six-spindle vertical chucking lathe and single-spindle automatics. Kummer Freres displayed high-precision semi-automatic lathes, and Oerlikon showed Spiromatic two-column radial drills, grinding machinery and a special



Induction hardener for 75 to 630-mm dia gears . . . heats teeth individually with automatic cycling. Work carried on vertical spindle is fed slowly downwards past U-shaped HF coil, then treated tooth is locally quenched by water spray. Gear fast-returns up, clearing coil, and indexes by one pitch. Operation then repeats. Spiral gears can be hardened, too



Twist drill grinder . . . with oscillating chuck has all motions power operated except initial infeed of the work to the wheel and indexing of the workholder through 180° to present the second face. Drills from 10 to 70-mm dia can be handled. Included angle is variable from 95 to 155°. Cross traverse wheel runs at 2130 rpm

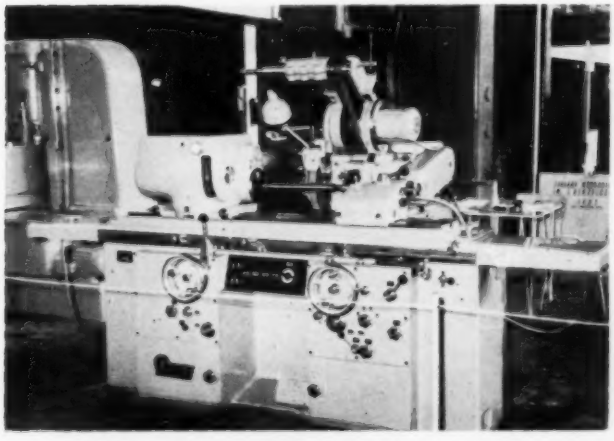
carriage wheel lathe for railway use.

Sweden was represented by ASEA welding equipment and Malcus grinding machines: Italy by Berlini engine lathes and grinders, and by Riva Cimat internal and centerless grinding machines. The Belgians showed a Riskin press and a Safak planer in their small hall.

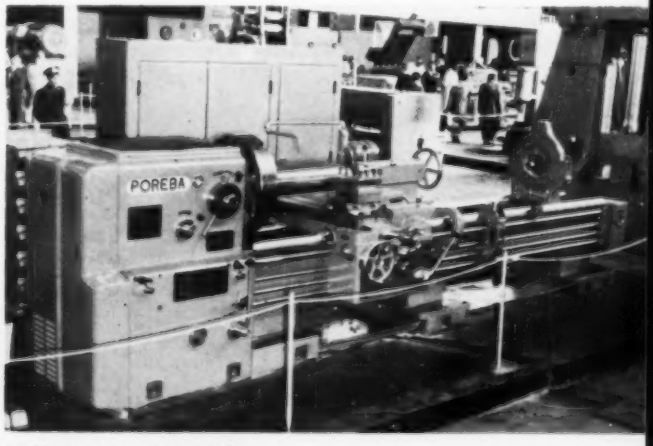
The USSR displayed a radial drill, a miller, a copying lathe, a gear hobber, various lathes (including a tape-controlled one), a thread grinder and several broaches, small tools and instruments.

Poland, of course, dominated its own show, demonstrating its ability or intention to produce practically every basic type of machine tool. But its most impressive exhibits were still those of its heavy machinery producers, who enjoyed an international reputation before WWII.

Six milling machines from I Maja works, near Warsaw, made an impressive showing—were distinctive in design, sturdy, and compared favorably with their Western equivalents. Poland's entry into the milling machine market is perhaps the most noteworthy evidence of its intention to make a bid for world machine tool markets.



Polish cylindrical grinder . . . . . . has internal grinding attachment used with chuck fitted to main headstock. Fully rotatable wheelhead, combined with table's ±8° swivel permits handling of all tapers. Hydraulic feeds are stepless from 0.25 to 7 meters per min. Sizing gages are available for automatic cycling



Radio-type tuning dial . . . on Polish thread-cutting lathe shown at Poznan permits rapid selection of 55 available feeds, while a single lever changes pitch from inches to metric system. Swing is 710 mm. Variable-length beds provide center distances from 1.5 to 6 meters. Speeds range from 15 to 750 rpm in 18 steps

Tighter tolerances, new trends spur refresher courses in gaging

PROVIDENCE, R I—Several trends in metalworking practice are forcing production engineers and chief inspectors to bone up on the latest methods in gaging. Tighter tolerances on parts to improve product reliability, a demand for less scrap, and a desire to reduce inspection and operator labor will have their effects on shop practice, as Metalworking climbs out of the recession.

As evidence of the current interest in precision, Federal Products Corp held a second gaging seminar, July 14-17, with full attendance by personnel from a number of blue-chip companies. Encouraged by the results, the company plans to conduct similar 3-day conferences each month, beginning in September.

Precision parts output

In production of component parts today, there are two distinct categories in which product reliability is based upon precision:

- High production of consumer goods with tolerances seldom tighter than a few tenths.
- Manufacture of missile parts and specialty items to tolerances of 15 to 30 millionths. In this category, production is still secondary to the ability of the operator and machine to locate, clamp, and machine a part to such tolerances.

Vicious Circle

However, as the shop and the machine builder meet the challenge, the designer again cuts the tolerance in order to improve product reliability. This trend is accelerating. For this reason, Federal Products staged a seminar in which speakers from the company and experts from other concerns covered the entire field of precision measurement — micrometers, plug and ring gages, dial indicators, comparators, contour projection, air, air-electric and electronic gages, optical flats, and the interferometer, which checks gage blocks.

For the production of consumer parts, especially on center-type, centerless and internal grinding operations, the trend is now to bring gaging back to the machine. It has been found the more cost of gaging and percentage of rejects climb the farther gaging is removed from the actual metal-removal process. For this reason, in-process and post-process gaging is now arranged to signal the operator that the tolerance limit is being approached or exceeded, or to make automatic adjustments to the machine. Speakers, therefore, described various kinds of size-control gages—air, air-electric, and electronic—that can be adapted to these purposes.

An example was cited of the benefits of automatic gaging as applied to crankshaft grinding. By sampling procedures, efficiency was about 92%, but one operator was required per machine for a production of 1344 pc per shift and a piece cost of 3½ cents. After applying in-process automatic gaging, one man now runs the two grinders, output per machine is 1386 pc per shift and the cost per piece is now only 1½ cents. The savings paid for the gages in 60 days. Re-inspection was eliminated. Consistent with machine capability, automatic gaging tends to reduce the piece-by-piece variation in size of parts produced.

Defense contractors have a bone to pick with government policies

LOS ANGELES—Government came under attack here this month for its "Iron-Grid" policy of shutting off valuable exchange of information between scientists and technicians of established top security levels working on parallel defense projects. The attacker was California's stormy Strategic Industries Association, an association of defense subcontractors and small primes.

At the same time, the Strategic Industries Association set forth some other goals it has set for itself as spokesman for small defense business, namely:

- To urge support for industry freedom to set its own depreciation rates when purchasing capital assets. Allowable rates, of course, are currently established by the Internal Revenue Bureau.
- To propose that subsistence allowances be established for business taxes, with the first $5000 of all business income to be exempt.
- To urge that the government increase negotiated procurement. And that government-advertised bidding be confined to items of common supply. Also, SIA asks that 1957 cuts in progress payments be restored.
- To propose that legislation be enacted to assist in expansion of privately owned small businesses. This is directly in opposition to proposed federally operated capital banks, which could extend government controls over small firms.

At the same time, the Association reaffirmed its stand on renegotiation, competing government facilities, and proprietary rights.

Renegotiation should be allowed to terminate, SIA thinks, because it restricts the incentive to earn profits and thus eliminates incentive to reduce costs.

Regarding government facilities, SIA feels that unless all industry-operated government facilities are put on a rental basis comparable to private ownership costs, competition among defense producers can never be on an equitable basis. According to SIA officials, there is about $10 billion of government facilities now operated rent free by major firms.

Regarding proprietary rights, the Association says that weapons superiority cannot be achieved without incentive to make developments—and this means the inventive company must be protected.

Red China Now Hot Rolls Gears

TOKYO (McGraw-Hill World News)—Peking Radio recently announced that Shenyang Machine Plant in northeast China has begun making gears by the hot rolling method—"the most advanced method internationally."

Time required to make one set of gears by this method, Peking Radio says, 1.5 to 2 minutes. That's one-thirtieth to one-fiftieth of the time ordinarily taken in most Chinese factories.

The Chinese Communists claim the hot-rolling method not only saves time, it doubles the durability of the gears.

1 Chassis assembly . . .
the frames are laid across two strands of SS bushed roller chain. Stock is at both sides; springs, wheels, driveshafts, mufflers, rear axles, differentials, and the like. Near end in picture is completed end

Automatic transfer solves assembly jigsaw puzzle

Problem: you have 800 automobile bodies in various stages of assembly at a given time. They must dovetail with 23 body styles, 16 colors and 33 upholstery choices. Output capacity is 35 cars an hour—175,000 a year. How do you bring all these components and factors into line at the right time and place?

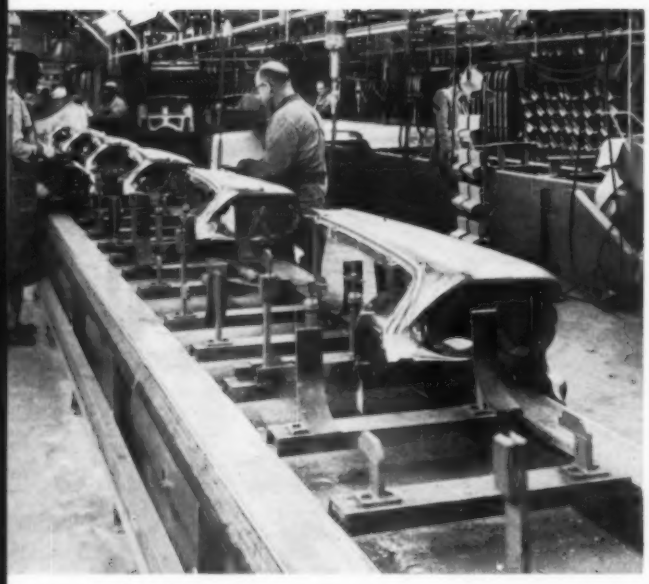
Ford Motor Co has found the answer at its new Rivera, Calif, plant, where Mercurys are made: automatic handling of engines, frames, and bodies with self-actuating transfer mechanisms between conveyor lines — or pushbutton stations at points where selections of styles, colors and so on must be made.

It takes 100 conveyors (3½ miles of them) to do the job, with most of them carrying parts through such operations as assembly, trimming, and painting. Others just move parts from one place to anothe. All floor conveyors were engineered and built by Link-Belt Co. Also involved: 98 hydraulic lift tables, 28 transfer tables, 7 turntables, more than 2000 ft of gravity roller lines. Following picture story shows how parts move through the plant.

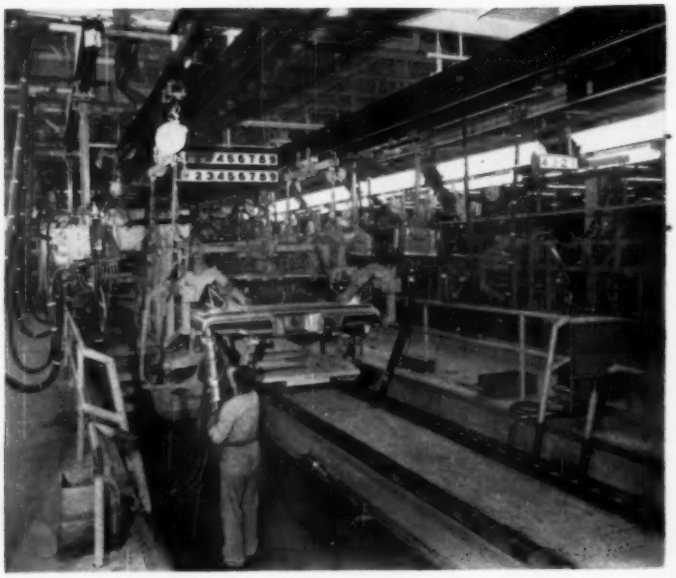
(continued on next page)

2 Instrument panels . . .
are put together on slat conveyor 135 ft long, move past operators at steady pace. Parts here are electrical fittings, gages, and inserts

Automatic transfer solves assembly



3 Fenders . . .
both lefts and rights are finished before painting on slat conveyor 135 ft long. Two strands of chain pull the slats, which also include riser blocks to fit the fenders

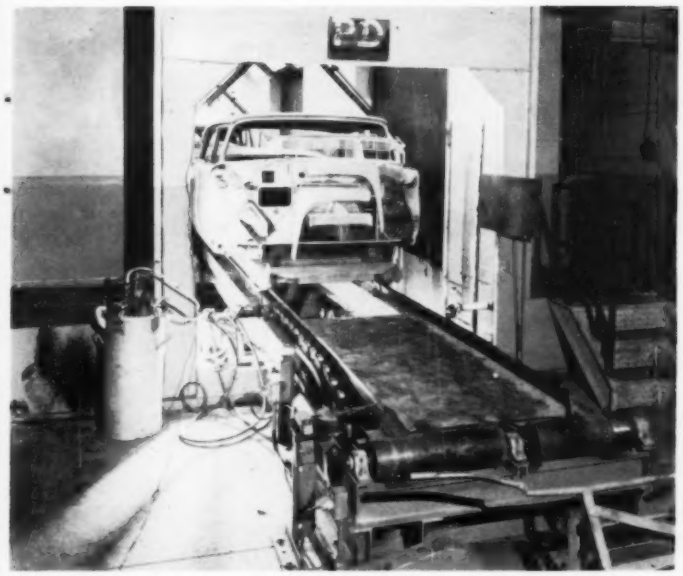


4 Body welded . . .
gate line assembles side panels to floor-pan assemblies. Both sides are lined with spotwelders; bodies are carried on pallets by floor chains, but pit here is bridged so bottom welding can be completed

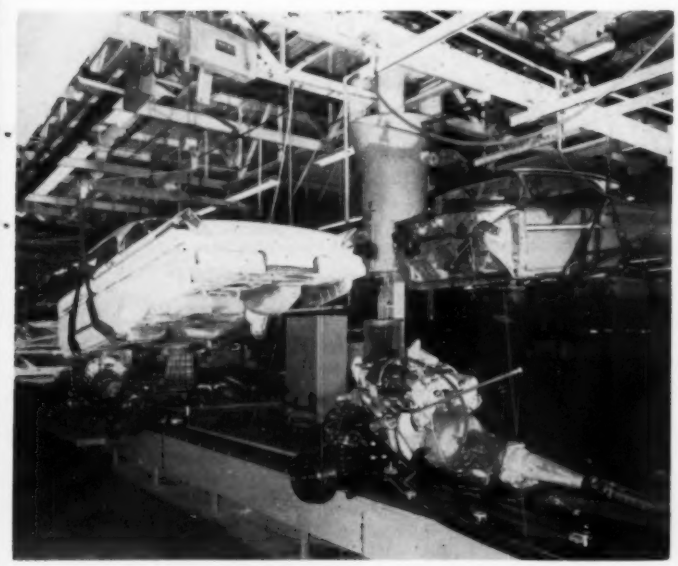
6 Sequence is established . . .
with teletype, foreground, which indicates order of body transfer from second-floor storage to main floor. Bodies ride on skids equipped with live rollers to allow easy movement

7 Body storage . . .
90 bodies can be held in twin-deck ten-conveyor area. Bodies are pulled from storage by elevator on tracks, then set on transfer stage (left). Body is lifted to overhead hoist that delivers it to decking location on final-assembly line. Skids are rotated and chuted to return them to head of body line

jigsaw puzzle . . .



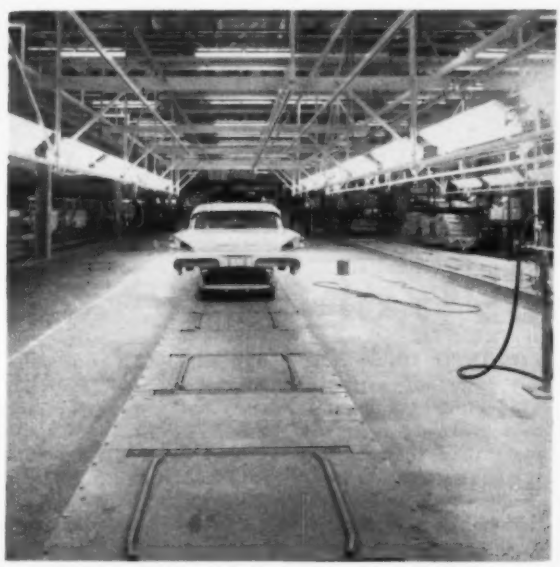
5 Painting . . .
is done on second floor for dirt-free operation, in ventilated booths. Car is here going through booth backward, over pit where sound deadener is applied after painting



8 Body joins . . .
chassis and engine at start of final-assembly line. Hood assembly is added, then wheels

11 Flat-top conveyor . . .
moves cars on wheels. Single strand is enough because plates with teeth catch on rear tires to idle cars along. Area is for paint repair, trim, and inspection

9 Roller conveyor . . .
powered by dual chains keeps operating even when bodies are held back by end stop. Bodies are inspected and touched up after second coat of paint here



10 Powered rollers . . .
driven by chains and sprockets under floor plates move bodies along trim-repair line

Here is how Canadian equipment stacks up

INDUSTRY	ALL EQUIPMENT Units	11-20 Years %	Over 20 Yr. %	MACHINE TOOLS Units	11-20 Years %	Over 20 Yr. %
Agricultural implements	6,480	38.8	24.4	3,005	40.4	30.4
Boilers, plate, structural	14,066	29.8	21.0	3,746	43.3	21.3
Machinery industry	20,795	40.1	17.8	12,921	44.7	18.9
Machine shops; machine tools	13,872	35.2	14.2	9,843	38.5	17.1
Heating and cooking apparatus	6,375	40.0	11.2	2,741	40.7	16.0
Hardware tools & cutlery	20,148	35.9	13.7	13,609	38.3	14.2
Sheet metal, wire goods	20,948	26.8	23.8	6,600	30.0	23.6
Iron castings; pig iron	11,469	37.5	19.7	6,441	40.3	25.2
Office and household machinery	16,170	41.5	11.5	9,039	50.2	12.8
Aircraft and parts	9,224	19.2	0.6	5,953	21.4	0.7
Motor vehicles	15,814	22.8	18.9	7,400	33.6	25.5
Motor vehicle parts	24,830	40.8	18.3	14,816	45.8	22.4
Misc. transportation equipment	14,768	41.5	30.1	6,058	43.9	32.4
Electrical apparatus	16,814	37.1	16.7	8,026	40.3	18.2
Electrical appliances	14,601	37.1	11.0	6,597	36.6	9.8
Chemical industry prods.	4,030	65.3	5.7	1,740	57.8	7.9
Non-ferrous metal prods.	14,566	35.1	13.7	7,369	38.6	13.7
Mining	5,623	23.4	16.0	2,348	27.5	20.9
Miscellaneous industries	5,745	32.7	11.7	2,666	35.0	17.3
Tech. & vocational schools	5,343	29.1	18.6	4,007	28.5	22.0
GRAND TOTAL	261,681	35.3	16.9	134,925	39.9	18.4

69% of Canadian production equipment

TORONTO, ONT—Canada has 262,000 pieces of major metalworking production equipment—17% of them more than 20 years old, and 52% more than 10 years old. Those are the figures just released by Canadian Machinery and Manufacturing News, which has just completed Canada's first Census of Metalworking Production Equipment. The Census's breakdown of industry, area and machine classifications is similar to that employed in previous AMERICAN MACHINIST Inventories of Metalworking Equipment.

Compares U S, Canada

How does Canada stack up with the United States in age of machine tools and metalworking equipment? When the latest *American Machinist* Inventory of Metalworking Equipment was taken in 1953, 17.4% of all U S metalworking machines were over 20 years old (Canada today: 16.9%), 20-year-old machine tools equalled 18.9% of the U S total (Canada today: 18.4%). Some 25.4% of U S metalforming machinery in 1953 was more than 20 years of age, compared with Canada's current 23.9%.

Thus it can readily be seen that Canada's plant and equipment today is in much the same state as was U S equipment five years ago. The exact status of U S metalworking equipment today will be published next November in *American Machinist's* eighth Inventory of Metalworking Equipment, an Inventory that is taken every five years. Processing of returns for *AM's* Inventory has not yet reached the stage where any current comparisons can be drawn between U S and Canadian metalworking equipment.

Of the 262,000 items of metalworking equipment listed in the Canadian survey, 135,000 are machine tools (18.4% over 20 years old, 58.3% over 10 years old). Also listed are 45,000 pieces of metalforming equipment, of of which 23.9% (11,000 pieces) is over 20 years old, and 55.8% more than 10 years old.

In the "Other shop equipment" category (welding machines, materials handling units, etc) are 82,000 items—10.3% (or 8400 pieces) is more than 20 years old, and 29.2% (24,000) 10 years old or more.

Average ages of metalworking equipment in Canada would be greater were it not for the aircraft industry, which because of sweeping product changes has virtually eliminated all World War II equipment. In fact, equipment acquired over the last 10 years by Canada's aircraft industry amounts to something like 80% of capacity. This estimate is based upon returns from 36% of the aircraft industry.

Canada's transportation industry has the highest percentage of older machines, mainly because of its railway locomotive shops, where the bulk of equipment is employed in maintenance, rather than in manufacture, of steam locomotives. And with the steam locomotive pretty much on its way out, railways have deferred purchase of new equipment.

The diesel locomotive, according to the editors of the Census, has changed the transportation industry and its equipment picture considerably in Canada, to the point where machines to fabricate welded engine blocks, electric motors and generators, and in some cases entire diesel engines, are found in other industries, too.

But the transportation industry is exceptional—in other industries obsolescence follows more natural patterns. Canada's chemical industry, for instance, has only something like 5.7% of its equipment that could be classified as obsolete, and the electrical appliance industry 11%. These are the shining examples of modern-

industry by industry

METAL FORMING MACHINERY			OTHER SHOP EQUIPMENT			Total eqpt. in each industrial div.	Employees in firms reporting to total
Units	11-20 Years %	Over 20 Yr. %	Units	11-20 Years %	Over 20 Yr. %	%	%
1,189	36.3	40.2	2,286	37.8	8.3	2.5	81.5
1,841	20.6	44.7	8,479	25.7	15.7	5.4	48.7
2,274	29.1	23.1	5,600	34.0	12.4	7.9	50.2
1,144	31.2	13.6	2,885	25.4	4.5	5.3	64.5
1,695	42.7	11.5	1,939	37.5	4.2	2.4	43.7
2,948	31.8	22.6	3,591	30.6	4.4	7.7	48.0
7,919	25.6	27.9	6,429	24.9	18.8	8.0	48.3
922	33.0	27.7	4,106	33.9	9.2	4.4	41.9
2,349	30.7	16.8	4,782	30.7	7.0	6.2	68.5
710	31.4	1.5	2,561	10.5	. . .	3.5	36.5
1,833	20.1	50.5	6,581	11.6	2.7	6.1	60.5
4,375	35.5	15.0	5,639	31.3	11.5	9.5	31.2
1,964	28.8	54.8	6,746	42.7	20.9	5.6	53.0
3,840	36.2	18.3	4,948	32.7	13.1	6.4	65.2
4,188	28.6	17.2	3,816	32.7	6.4	5.6	36.2
1,313	84.5	3.2	977	54.0	5.0	1.5	33.0
2,818	29.4	23.2	4,379	32.9	7.6	5.6	92.4
345	27.5	29.9	2,930	19.3	10.1	2.2	48.5
891	46.9	12.5	2,188	24.0	4.4	2.2	33.8
344	28.8	15.1	992	31.4	6.2	2.0	. . .
44,902	31.9	23.9	81,854	29.2	10.3	106.0	48.8

over 10 years old, Census finds

ization in Canada. At the other end of the scale are the structural steel and farm implement fields.

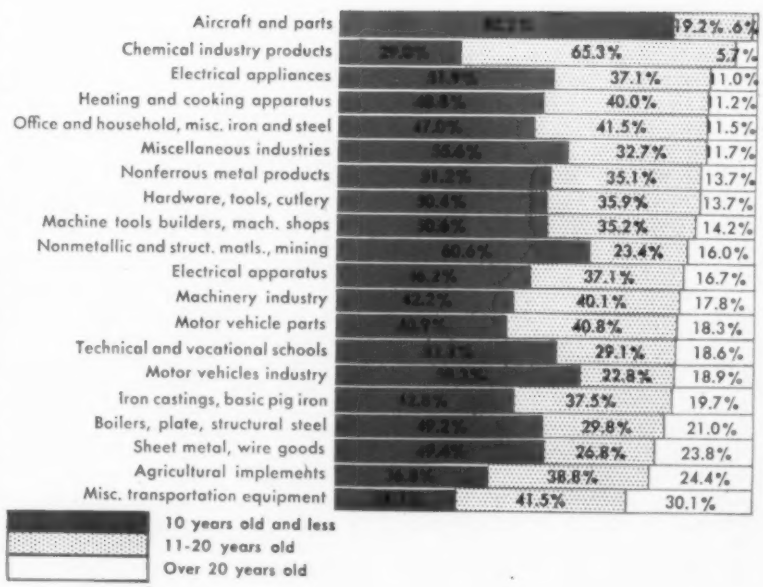
Oddly enough, although technical and vocational schools are noted for their preponderance of obsolete equipment, in Canada they do not fall into the lowest classification.

It would also be expected that more obsolete equipment would be found in those industries devoted more to maintenance than manufacture, but with the exception of the aforementioned railway locomotive shop category, such industries reversed expectations by having only 5.63% of their equipment in the over-20-years-old category—less than a third of the all-metalworking-industry average of 16.7% obsolescence.

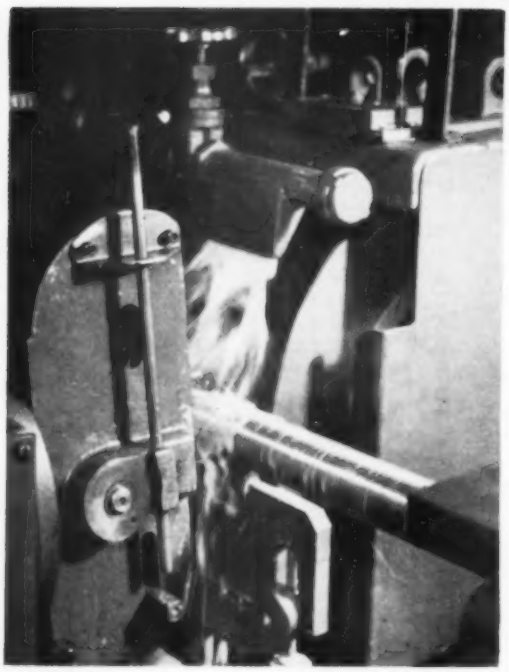
But with machine tools themselves, the maintenance category ran truer to form—23.9% obsolete machines against all industry's 17.9%.

The magazine's editors made an arbitrary asumption that in a given industrial category there is a certain amount of metalworking equipment per 100 employees. Because the 2600 replies received represent a broad cross-section of many metalworking fields, it can be assumed that this method has produced a census of unusually high accuracy.

...and this is how age distribution looks in various Canadian industries



Which cutting fluid for abrasive belt grinding?



Out of the welter of confusion about "cutting fluids" (even the name is misleading when it applies to solids and gases) here at last are concrete test data that answers a frequently repeated shop question . . .

DR HUGH N DYER, director of product testing,
BEHR-MANNING CO, Division of NORTON CO, TROY, N Y

Flooding the work . . .
with soluble oil at the grinding point helps to produce consistently fine finishes on this abrasive-belt centerless grinder

Solids, liquids and gases for cutting and grinding—lumped by common usage under the all-inclusive term "cutting fluids"—have a sixfold job: (1) to cool the work and conduct heat from the zone of chip formation, (2) to wash chips away from the grinding zone, (3) to reduce friction and wear between abrasive and work, and abrasive and chip, (4) to improve finish by modifying the cutting action of the abrasive, (5) to improve abrasive life by reducing loading and lessening abrasive grain wear, and (6) to protect the work and the machine from rust and corrosion.

Each of the three types of cutting fluids—solids, liquids or air (gas)—accomplishes this in a different way. For example:

- **Solids** are free-machining additives that are applied to the work material, and that treat the surface of the cutting tool. They can be low-shear-strength solids formed at the chip-tool interface by chemical action, or they can be solid lubricants deposited on the tool or work.
- **Liquids** may have either a water, mineral oil, wax, or grease base. Each type may contain additives to accomplish specific objectives.
- **Air** is not generally considered a grinding fluid, but it must be remembered that if oxygen isn't present, little or no grinding can take place—metal is merely pushed around and normal chip formation doesn't occur. This is because freshly formed, uncontaminated virgin metal surfaces readily form pressure welds, and when oxygen is absent the chips reweld to the base metal as fast as they are formed.

In the presence of oxygen, freshly cut metal surfaces are quickly coated with an oxide film that prevents rewelding. Some other substances, some of them more effective than oxygen, also form similar contaminating films.

Because the term "cutting fluid" is a misleading one when it applies to solids and gases, let us substitute "grinding aid" for it.

First, the solid grinding aids. Additions of sulfur or lead are sometimes made to steels to improve machinability. Resulfurized steel (SAE 1112 for instance) contains high percentages of sulfur and manganese which form manganese sulfide, and prevent formation of iron sulfide, which makes steel brittle.

Manganese sulfide also acts as a built-in aid to prevent pressure welds. Such resulfurized steels, widely used on automatic screw machines because of their good machinability, are as easy to grind as low-carbon steels.

With certain stainless steels, however, the situation is quite different. Type 304 is known for its tendency to gall and reweld and is difficult to grind with water-base fluids or straight mineral oils. Type 303 is similar to 304, except for a fairly high percentage of sulfur, phosphorus or selenium. As a result, Type 303 requires only straight mineral oil to grind as easily as low-carbon steel and much more easily than Type 304.

Surface treatment of the cutting tool to improve grinding performance (by employing fillers with melting points near that of the metal being ground) is common in grinding wheels, not in abrasive belts.

Formation of low-shear-strength solids by chemical reaction between grinding fluid and work has proved effective on stainless steel and titanium. These solids are formed when the cutting fluid is (1) subjected to high local temperatures approaching the melting point of the base metal, (2) high local pressures, and (3) clean metal surfaces.

Oils containing sulfur, chlorine, or phosphorus will react with freshly cut surfaces to form low-shear-strength films which act as solid

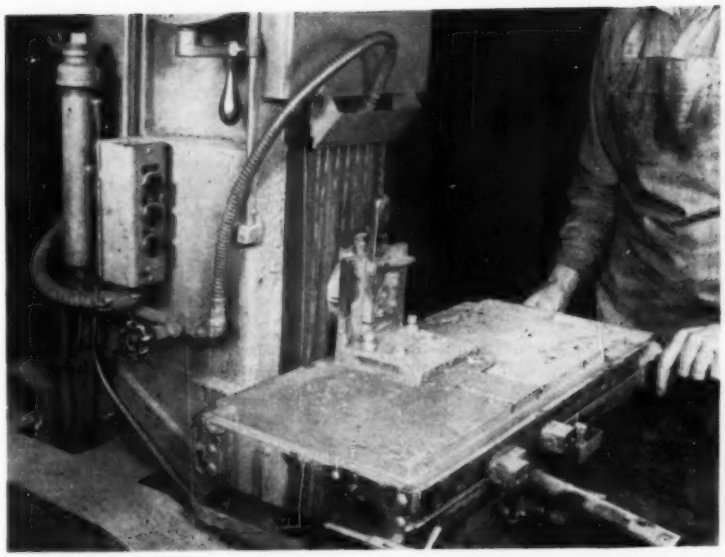
lubricants and also prevent formation of pressure welds. Some inorganic salts in water solution may also react in this way under certain conditions.

These films also serve to reduce chemical and physical reactions which might cause the grain points to dissolve in or react with the metal, leaving dulled and worn grains on the surface of the coated abrasive belt.

Such reactions have been proved in point endurance studies, involving scratching a polished roll with single, conical abrasive points.

Silicon carbide for example, produced a long scratch on glass but a short one on steel. The reverse was true for aluminum oxide. Silicon carbide resisted attack by glass, but dissolved in steel. Aluminum oxide resisted attack by steel, but was attacked by glass.

Solid lubricants are generally high-melting waxes which reduce grain penetration and thus yield superior finish. Solids (such as graphite and molybdenum disulfide) are good anti-friction materials because of their crystal structures, and the latter probably also reacts chemically with the work. But they are seldom, if ever, used with coated abrasives.



Aluminum die castings . . .
are faced with a waterproof silicon-carbide belt, using a soluble oil grinding aid applied in small multiple streams

GASEOUS GRINDING AIDS

The role of atmospheric oxygen has already been mentioned. It is known also that atmospheric water vapor can modify the chemical reactions between abrasive grain and work. Thus any "dry" grinding operation can be regarded as one using air as grinding fluid. Fluids that exclude air from the grinding site are not always beneficial, may actually be detrimental unless the field used is at least as effective as air.

For instance, CO_2 can be used as a grinding fluid, but its principal effect is to cool the work. Otherwise, it may actually interfere with good grinding by excluding oxygen.

LIQUID GRINDING AIDS

The most common grinding aids (other than air) are liquids. There are hundreds of commercial grinding liquids and additives available, and individuals have introduced additives ranging from tobacco juice to cow's milk.

Some of the more important classes of commercially available liquid grinding aids are: Straight mineral oils; sulfurized, chlorinated, or sulfochlorinated mineral oils; fatty oils; mineral oils with fatty additives; "soluble" oils; solutions of wetting agents, rust inhibitors, and chemical additives; heavy emulsions of mineral oils, fats, chemical additives, waxes, etc; and waxes (paraffin, beeswax, stearic acid, chlorinated wax) and greases.

Both naphthenic and paraffinic base oils are available, the former being cheaper and more generally used. They have the advantage of greater solubility for additives, making it easier to produce stable compounded cutting oils, but paraffinic oils have higher flash points.

Mineral oils are quite stable chemically, and do not react with work or abrasive to any appreciable extent. The conditions of pressure and temperature in the immediate vicinity of the grinding points are so severe that no hydrodynamic lubrication of any consequence takes place during grinding.

Abrasive-belt tests on carbon and stainless steel (in which a straight mineral oil was compared with "soluble" oil-water preparation) showed that mineral oil gave longer belt life and faster stock removal than soluble oil. Belts used with mineral oil showed more shedding of the abrasive from the backing than did those used with water-base fluid. Belts used with water became dull and glazed, and ceased to cut, even though most of the abrasive material was still present.

In "mild" grinding, a mineral oil may promote enough shedding and loss of grain to give more efficient production than a water-base fluid because the oil tends to penetrate between the grains and the adhesive film, saturates the fibers of the cloth, and reduces effective bond strength. A further advantage of mineral oil is that it can be used with non-waterproof coated abrasive, while water-base fluids require the more-expensive waterproof types.

The effectiveness of straight mineral oil may be increased by adding other materials. It is frequently sulfurized by cooking with flowers of sulfur or compounds containing sulfur. Chlorine may also be combined chemically. Many heavy-duty grinding fluids contain both sulfur and chlorine, which react with iron to form low-shear-strength solid films, that reduce friction and prevent rewelding.

Sulfur and chlorine are particularly effective on Type 304 stainless, where galling and rewelding are especially troublesome. They are less effective on low-carbon steels, and show little or no advantage on the softer metals or on such free-machining alloys as Type 303 stainless. Sulfur alone is generally more effective than chlorine alone, but the combination of the two may be more effective than either.

Most grinding fluids containing sulfur and chlorine are effective only under extreme conditions at the grinding point. Copper alloys are sensitive to attack by sulfur, however, and sulfurized oils for use on machines having copper-alloy parts,

should be screened for copper corrosion by the ASTM D130-55T method, or some similar test.

Fatty oils, olive, rape, castor, cotton seed, linseed, palm, lard, and sperm are used alone or added to mineral oils to provide more effective lubrication. All react with metal to form soaps, which are stable to much higher temperatures than the oils themselves, and thus behave as solid grinding aids. In belt-grinding tests on carbon and stainless steel, the addition of 10% lard oil to mineral oil worked better than straight mineral oil on carbon steel. On stainless, however, mineral oil alone was better. Even so, some of the most effective fluids for austenitic stainless are mineral oils with a combination of sulfur, chlorine, and some fatty oil additives.

Fatty oils are sometimes sulfonated by reaction with sulfuric acid before being added to mineral oil. These sulfonated fatty oils are water soluble, and are sometimes used in compounding "soluble oils."

SOLUBLE OILS

"Soluble oils" are really emulsions of mineral oil in water. Heavy-duty types contain sulfur, chlorine, or fatty additives. Many commercial products contain borax, sodium nitrate or other inorganic salts to inhibit corrosion.

The degree of dilution of a soluble oil varies with the application but, for most grinding operations, the concentrate is 20 to 80 parts of water to 1 of oil. The mixture has a milky appearance, and a viscosity only slightly different from water. Excessive dilution may lead to instability and breaking of the emulsion, or to corrosion difficulties.

Soluble oils are inexpensive and easy to mix with tap water. The mixture presents no fire hazard, and it does an effective job of preventing rust, cooling the work, and flushing away chips. Their effectiveness as a lubricant and antiweld agent is much less than that of a compounded mineral oil.

Nevertheless, for soft metals, plastics, and glass (where work must be kept cool and dust dispersion minimized) soluble oils do an effective job and usually eliminate cleaning and degreasing operations that can add considerably to costs.

A comparative newcomer is the true water solution. This concentrate, which contains wetting agents, rust inhibitors, dyes, perfumes and chemical additives, is diluted with water in the same way as soluble oils but is a clear solution instead of an emulsion.

Properties are similar to those of soluble oil, except that the problems of stability and rancidity are overcome. They have good cooling and wetting properties but, generally, have not been as effective as compounded oils when chemical aid is required. And problems of controlling corrosion have not been completely solved.

In grinding titanium, water solutions of chemicals (such as sodium nitrate or barium nitrate) are effective, but they present corrosion and toxicity problems, and are not developed to the point where they can be recommended for general industrial use.

METHODS OF APPLICATION

Most liquid grinding aids are applied in a low-pressure stream or flooded-in as close as possible to the point of contact between work and coated abrasive.

Some liquids and solids are applied periodically to the surface of the work or the coated abrasive to improve surface finish and prevent loading. They are used mostly with fine-grit abrasives, and may be applied as a cake or stick held momentarily against the belt, or as a spray of dissolved or emulsified wax, oil, or grease.

One type is a hard, high-melting waxy material which builds up on the surface of the abrasive in a fairly heavy layer, almost completely covering the grain points. It gives good finishes because of the reduced grain penetration and scratch depth. Chips are held in suspension in the wax and have no opportunity to become firmly embedded in the abrasive coating. Fine-grit belts can thus produce uniformly excellent finishes on soft material for a long period, without leaving wild grain marks or tears from rewelding. The surface is excellent for buffing, but stock removal is extremely low.

Where higher stock removal is required with no loss in surface finish, and where loading and filling must be avoided, an easy-flowing, lower-melting wax or grease is used. This exposes more grain for cutting, yet good surface finish can be obtained. Either type may be removed with solvent, so the belt can be regreased and reused several times.

Coated abrasives appear to be unique in their ability to make effective use of grinding fluids at higher speeds than other grinding or machining methods, and high-pressure jets seem to offer no particular advantage.

Mist application is suitable for finishing operations in which the fluid is applied intermittently to the belt, or where the machine is not designed for flood application. Otherwise, flooding usually provides more effective cooling and chip removal, faster stock removal, and longer life.

PRACTICAL PROBLEMS

Some additives cannot be used because of allergic reactions that might develop during exposure to mists and fumes. Where several additives are used, they must be compatible with one another under all operating conditions.

All ingredients must be stable, and sufficiently nonvolatile as not to evaporate over long periods of exposure in open tanks. Tendency toward formation of gums or foams must be avoided, and the fluid should not exhibit an unusual tendency to smoke or fog.

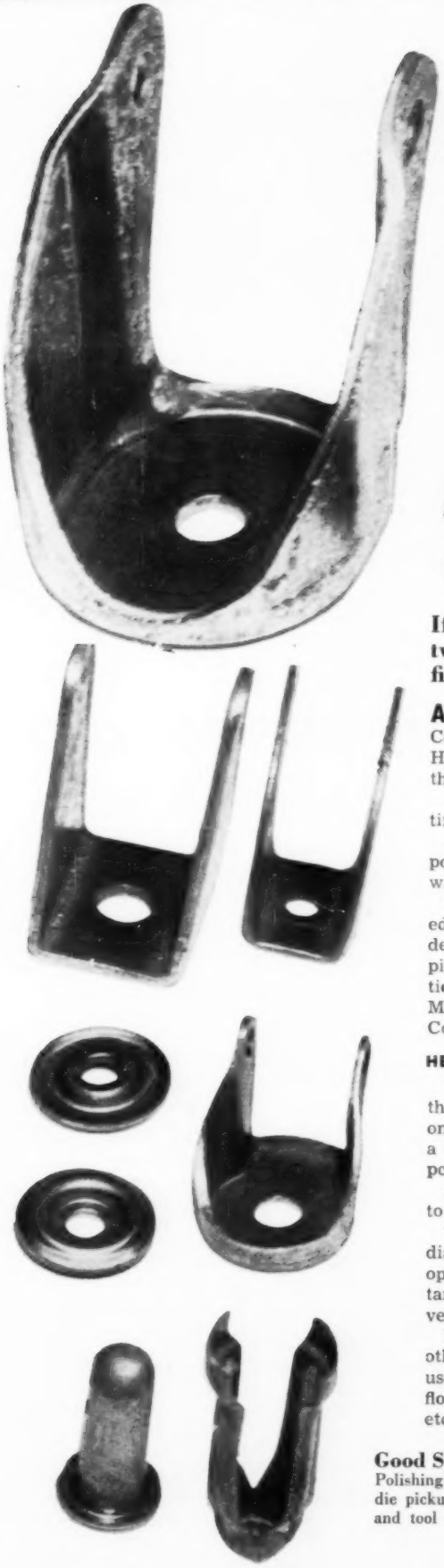
If bacteria tend to grow in the fluid, a suitable bactericide must be incorporated.

Grinding oils sometimes have a tendency to smoke or fog, particularly during heavy stock removal. If the gain in productivity is great enough to demand the use of oil, it may be necessary to install a fume collecting and precipitating system.

Well designed filters, pumps, and collecting and settling tanks will usually pay off in savings in downtime required for adding fluid and for cleaning out chips. In this connection, the fluid should have a low viscosity and low surface tension to prevent excessive drag-out. With soluble oils, excessively hard water may require special treatment.

While most commerical grinding fluids are free of corrosive tendencies, it is wise to investigate the effects on any new or unusual metal or combination of metals. Dissimilar metals develop a contact potential at their interface, and the fluid may become corrosive—even though it is noncorrosive with single elements of the combination.

It is not always easy to determine the relative costs of alternative grinding fluids. The relative cost-per-pound of grinding fluid may have little or nothing to do with costs of actual usage. Such factors as operator preference, extent of dilution, effective life of the fluid, effect on production, loss during operation and fire hazard, must all be evaluated in making a decision between comeptitive products.



A Dab in Time . . .
Occasional applications of moly-disulfide lubricant increase die life, permit deeper draws, produce a smoother finish

MoS_2 cuts die maintenance

If you have ever rubbed the unctuous black powder between your fingers, you will understand why one stamper finds that it minimizes galling and pickup

A couple of years ago, the methods man at Bassick Co, Bridgeport, Conn, rubbed some "black stuff" on a die for forming a caster part. He proposed to overcome scoring, to make polishing unnecessary, and thereby get a profitable order.

Press operators scoffed at his idea. But it worked, and it has continued to work in a number of applications.

Bassick uses the black stuff—molybdenum disulfide—either as a powder for dry-film lubrication or mixed into oil. When used either way, MoS_2 provides sustained lubrication under severe conditions.

The compound first attracted attention when auto enthusiasts adopted it several years ago. Since then, many MoS_2 lubricants have been developed for industrial purposes. Prevention of galling and metal pickup in pressworking operations, for example, is one field of application. In Bassick's case, shop needs are being met with a Molykote Microsize lubricant produced by Alpha Molykote Corp, Stamford, Conn.

HERE ARE SOME OF BASSICK'S OTHER EXPERIENCES:

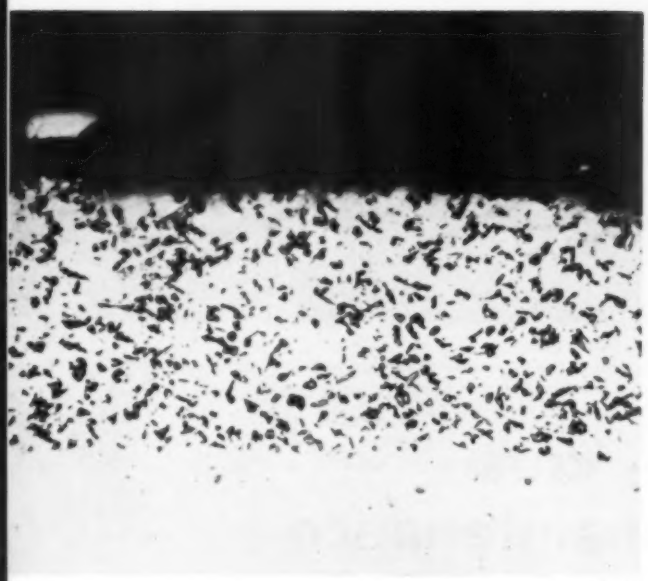
On a combined blanking, drawing and trimming operation, in which they produce a 2-in. tubular part from SAE 1010 steel, a mixture of one tablespoon of Microsize to one gal of oil is applied to the strip by a spray lubricator. Die life has been increased from 60,000 to 250,000 pc, and work is turned out without score marks.

For a smaller but similar job, die life has been increased from 8 hr to 1½ weeks.

The MoS_2 powder is also applied dry to strip stock, to make 1-in.-dia half-round glides for table legs from SAE 1010. At intervals, the operator rubs the powder onto the underside of the strip, for a distance of about 3 ft. Enough lubricant is carried into the dies to prevent pickup and preserve a good surface finish on the parts.

Besides better product quality and increased die life, there are two other angles to Bassick's experience with moly lubricants. They now use less lubricant throughout their operations. One result is cleaner floors. Also, instead of keeping three diemakers busy on die polishing, etc, they now need only one man.

Good Score: No Score Marks . . .
Polishing must be avoided to keep costs of Bassick casters competitive. Score marks from die pickup are avoided by using dry or oil-dispersed moly disulfide, according to press and tool conditions



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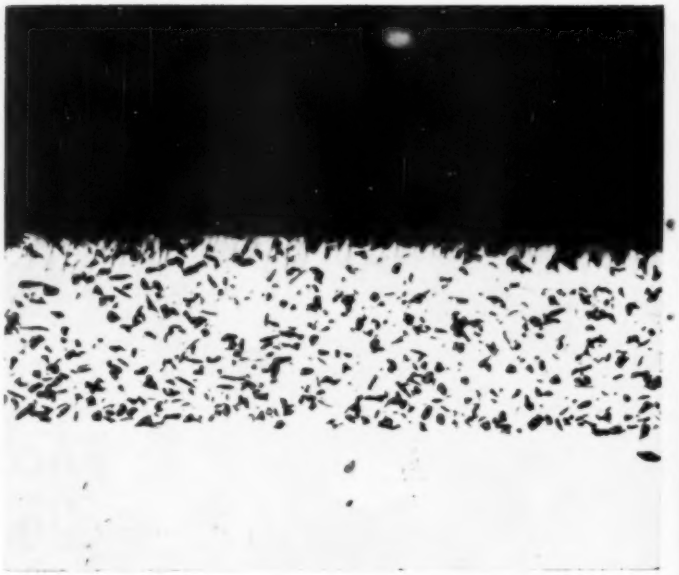

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Locating pin, plated with SiC-Ni (left photo) is shown at time of plating. Plating (Rc 54.5) was 0.0015 in. thick, particle size 6 to 7 microns. Right is pin after six weeks in transfer machine.

Carbides co-deposited by plating boost wear resistance 5 to 1 or more

BUFFALO—Something utterly new in plating — co-depositing of ultra-hard carbides or oxides with a wide variety of base metals—is producing coatings that outlast chromium, for example, by at least 5 to 1.

The process, developed by CEM Division of Platecraft of America Inc, Buffalo, and known as "Composite Electrochemical Materials," yields a composite electro-coating of finely divided hard particles in a metal matrix, yet is said to be as easy as conventional plating. Its uses are many — "from the housewife's scissors to ballistic missiles" — according to CEM officials. Platecraft has assigned exclusive licensing for the CEM processes in the US and Canada to Thompson Products, with the option of granting sub-licenses.

Basic idea behind the CEM process is that while carbides and oxides possess better wear properties than metals, they are too brittle to be fabricated as easily as metals. The CEM process is an economical way of coating metal parts with carbides and oxides to produce a metallic electroplated coating containing finely divided hard particles.

All metals that can be electroplated can be adapted to produce such composite coatings, and the result is a coat that retains the strength and most of the ductility of metal and which has wear resistance similar to that of carbides and oxides. In fact, CEM claims, mixtures impossible to prepare up to now can be applied to any metallic surface at low cost.

Silicon carbide, for instance, when co-deposited with nickel possesses remarkable wear resistance: a coating only 0.001 in. thick can double the life of saw blades. And in applications involving tooling and gages, the coatings have outlasted hard chromium 5 to 1 or more. Too, life of dies used in forging alloy steels has been improved.

In bearing manufacture, a composite of silicon carbide in silver is said to have eight times the wear resistance of pure silver. This same composite may be employed in manufacture of electrical contacts.

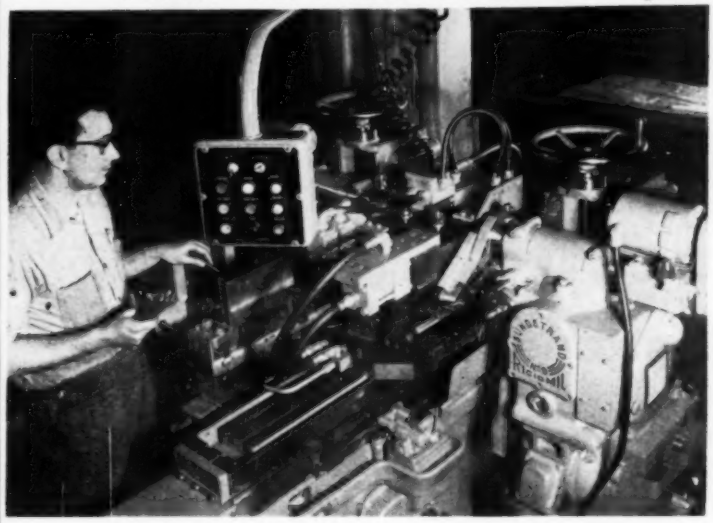
Aside from silicon carbide, tungsten carbide, titanium carbide, chromium carbide, aluminum oxide, zirconium oxide, molybdenum and tungsten can be dispersed in metal coatings and co-formed with such base metals as nickel, cadmium, silver and copper. Some CEM coatings, especially those based on nickel, increase oxidation resistance and corrosion resistance.

Using the CEM technique, it is possible to fabricate dispersions of uranium and thorium oxides or carbides in nickel, iron or cadmium. It may also be possible to prepare mixtures of rare earth oxides with cadmium or iron, and it is believed that this method will afford better control over particle distribution than is now possible — a factor that would increase its interest for the manufacturer of fuel elements and control rods for nuclear energy fields.

The CEM people believe that while its aircraft and missile applications are more glamorous (turbine blades, skin surfaces, friction brakes, bearings and the like), the process's chief value will be in manufacture of such household articles as knives, scissors, garden and home workshop tools.

CEM is expected to have application in metalworking tools and gages, in auto manufacture (engine parts, brakes, clutch disks), in missiles (nose cones, skin surfaces, combustion chambers), and in such other applications as woodworking tools, gun barrels and pressure vessels.

How to AUTOMATE production equipment

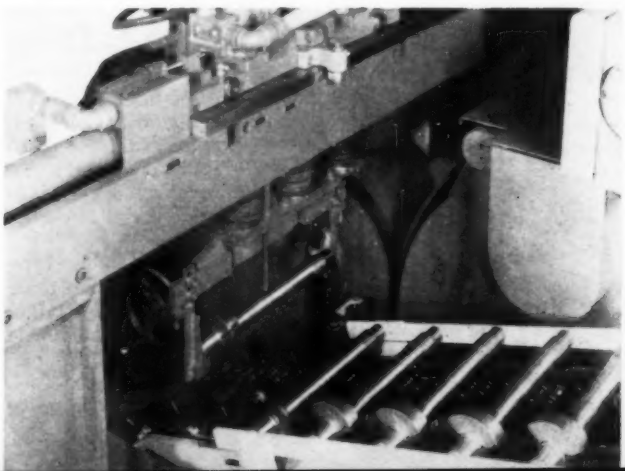


Shafts are pushed . . .
automatically from the V-bottom magazine into the fixture of this Sundstrand Duplex Rigidmil. Operation: to mill a flat and deburr each end of a small shaft

Eight parts fed to milling fixture

The hydraulically operated fixture of a Sundstrand Duplex Rigidmil takes up to 8 pc per cycle, for milling flats and deburring on both ends of shafts. At the end of the cycle, the table and fixture rapidly return to the starting position in line with the loading hopper or magazine. Parts in the bottom of the loader are located in V slots and are automatically pushed into corresponding V-slots in the fixture. Parts remaining in the fixture from the previous machining cycle are pushed into a discharge chute. When the new parts are positioned against a stop, they are clamped.

Automatic loader permits 17-sec. grinding cycle

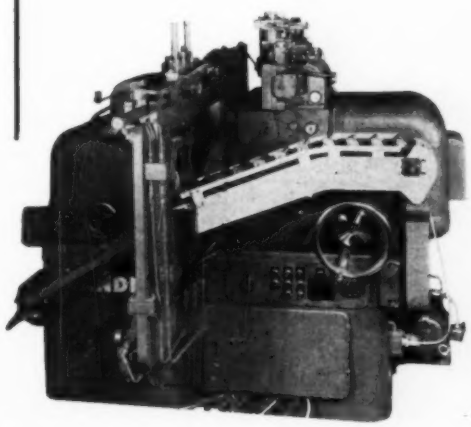


4. Magazine and chute feeds

continued . . .

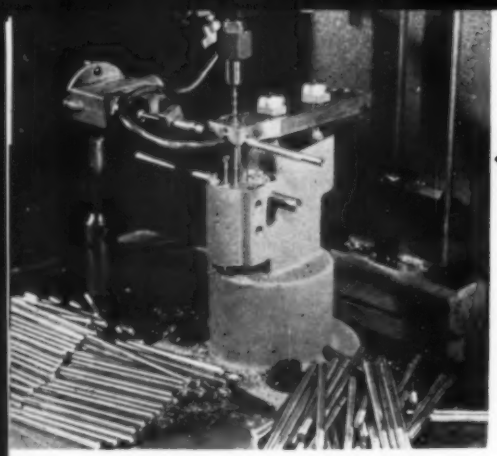
We gave you a number of examples of how these feeds are used (*AM*—June 30 '58, p 77-79). Here are additional ones typically applied to drilling, grinding, and milling jobs

RUPERT LE GRAND,
senior associate editor



A chain-type loader . . .
applied to a No. 12½ Landis centerless grinder permits grinding a pitman shaft at the rate of 250 parts per hr. The workpieces are hand loaded onto the chain conveyor, but presumably a conveyor could be arranged to perform this task as well

Carrier picks piece . . .
off the loader conveyor and traverses it to grinding position. Two diameters are ground simultaneously. Carrier then removes finished part and replaces it on loader for discharge to a chute



1...

Vertical clamping fixture...

Drill ⅛-in. cross-hole in ¼ in. steel rod. Production of 1200 pc per hr can be obtained. Production obtained on the other three parts if they were handled in this vertical clamping fixture would be about 900 to 1500 per hr

2...

Vertical dial index fixture with magazine feed . . .

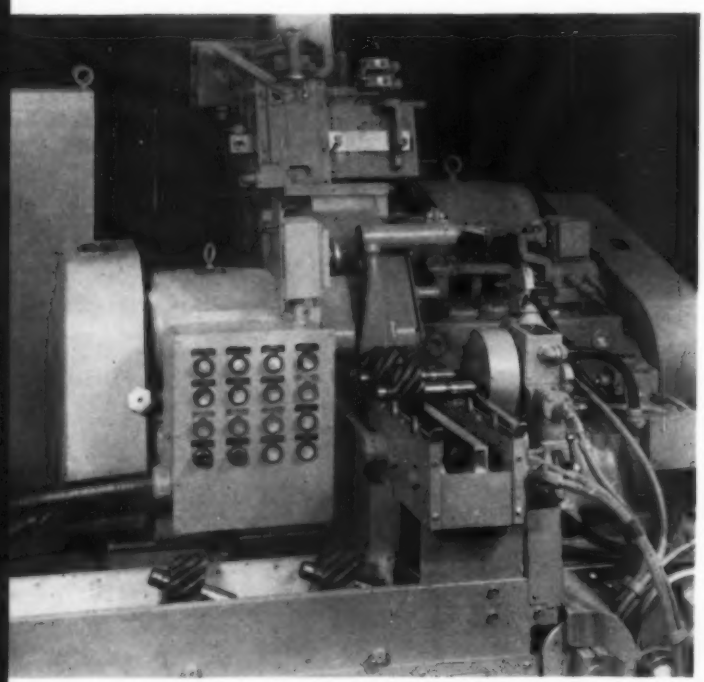
Drill No. 29 cross-hole in steel screw-machine part (depth ¼ in.). Production, 2600 pc per hr

Magazine fixtures double

Basic master fixtures for drilling operations will accept or can be adapted to many similar parts. The question of whether to use magazine-type fixtures usually depends upon quantity of parts, according to Snow Manufacturing Co, Bellwood, Ill.

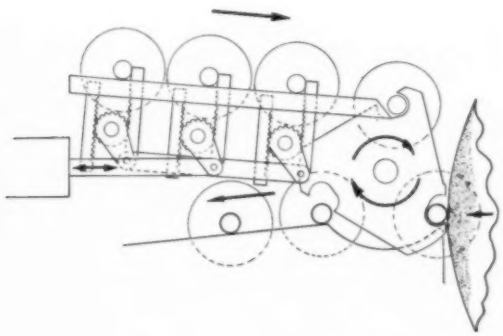
Assume that all of the four parts shown on the photographs are processed by one customer and that they originally were short-run quantities (*under* 10,000 parts required per setup). The average production that could be obtained at the hand-feed vertical clamping fixture, Fig. 1, on these operations would be about 900 to 1500 pc per hr.

The operator manually inserts the part into the fixture, pushing it against a spring-loaded locator and contacting a Micro-Switch to initiate the spindle cycle, synchronizing the clamping action of this air-operated fixture unit. After the hole is drilled and the drill spindle returns to the top of the stroke, the clamp releases,



Automatic loader controls . . .

passage of pinions down the chute, or inclined ways, toward a revolving turret. The turret places the piece between centers for grinding, then removes the ground piece and discharges it to a conveyor at front of machine



Schematic View of Loading Device

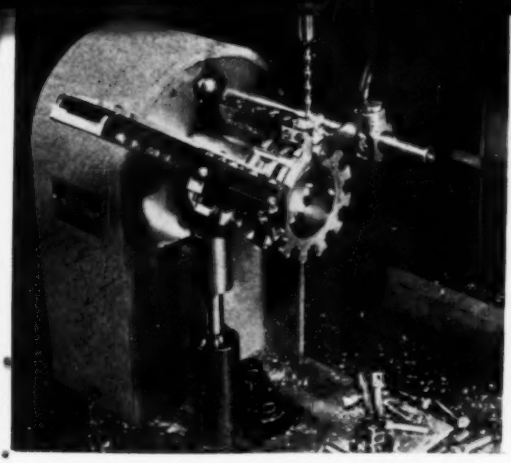
Retractable bars separate . . .

stem pinions to prevent them from interlocking and to present them correctly to the revolving turret.

Automatic loading of top-heavy parts

Automotive stem pinions are top-heavy parts on which a number of expensive operations have already been performed when it comes time to grind two bearing diameters and a spline diameter. Automatic loading and unloading avoids work damage from fatigue or inattention, and speeds the operation.

For this job, Norton Co supplied a 10-in. Type CTU semi-automatic cylindrical grinder that feeds the stem pinions to the automatic loading station and unloads the ground pieces automatically. One operator can control more than one machine.



3...

Vertical dial index fixture with magazine feed . . .

Drill No. 11 cross-hole through 7/16-in. dia brass screw-machine blank. Production, 2900 pc per hr

4...

Vertical dial index fixture with magazine feed . . .

Drill No. 44 cross-hole ¼ in. deep in 5/16 in. dia brass screw-machine part. Production, 4500 pc per hr

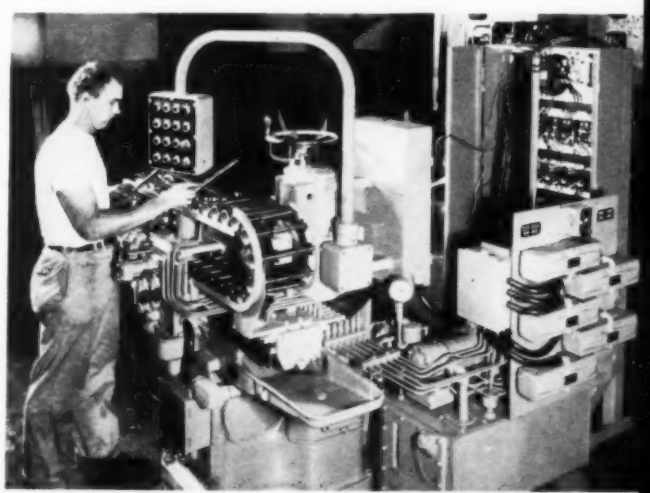
output on cross drilling

permitting the part to be ejected by the spring-loaded ejector.

The production that can be obtained from this type of fixture is limited to the manual dexterity of the operator and the drilling cycle time of the operation (depending upon type of material, size of drill, depth of hole, spindle speed, etc.). The operator must wait until one part has been completed before he can load the next piece. When quantity requirements increase (*over* 10,000 parts per setup), a new method of tooling is warranted in order to improve production and decrease cost per piece. The parts shown in Figs. 2, 3 and 4 adapt themselves to a magazine-fed, vertical, dial-index fixture. This does not basically change the drilling cycle time for any of these parts, but it is now possible for the operator to load the magazine while the drilling operation is being performed on another part. The feeding time is therefore decreased to the indexing time.

Chain feeder loads and unloads exhaust valves

Diesel-engine exhaust valves must be milled to length on a Sundstrand No. 0 Rigidmil. They are loaded onto the top of the continuous chain feeder. Automatic indexing of a sprocket passes the individual valves through the machining station located in the middle of the lower track of chain. Before each part is machined it is positioned endwise and clamped in a V-block by hydraulic cylinders. When machining is complete, the cylinders retract and the sprocket is indexed again to bring the next part into the machining station. Machined parts drop off at left end of table.



Operator places valve . . .

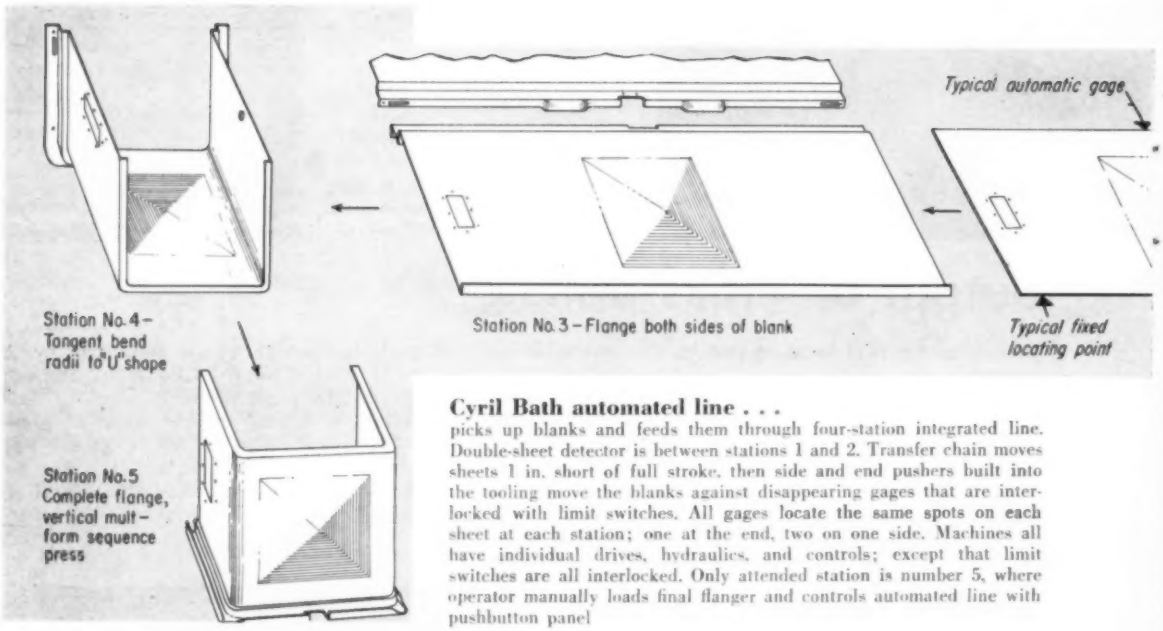
on chain-type feeder or magazine, but a conveyor or storage hopper could well be substituted for him

Magazine jig aids ball drilling

Fischer & Porter, Hatboro, Pa, manufacturers of process instrumentation, data reduction and automation equipment, uses a special jig to facilitate the drilling of ⅛-in. stainless-steel balls. Balls are used as valves in a differential pressure transmitter. Basically, the jig consists of a feed funnel and a disk which is rotated manually. Ball feeds from funnel into one of the holes around the rim of the disk. Disk is turned one hole position, which brings one of previous balls under drill bushing with spherical seat on the underside for clamping surface. Then the piston adapter rises to clamp the ball against the under side of the bushing. Drill spindle then descends and drills hole in ball. Ultimately, rotation of disk drops drilled ball through feed-out hole in body of jig. Brass sheeting over disk keeps chips out of the holes.

Ball held securely . . .

Air cylinder raises piston adapter, which lifts ball and clamps it against the spherically recessed drill bushing


Typical automatic gage
Station No. 4 – Tangent bend radii to "U" shape
Station No. 3 – Flange both sides of blank
Typical fixed locating point
Station No. 5 Complete flange, vertical multi-form sequence press

Cyril Bath automated line . . .
picks up blanks and feeds them through four-station integrated line. Double-sheet detector is between stations 1 and 2. Transfer chain moves sheets 1 in. short of full stroke, then side and end pushers built into the tooling move the blanks against disappearing gages that are interlocked with limit switches. All gages locate the same spots on each sheet at each station; one at the end, two on one side. Machines all have individual drives, hydraulics, and controls; except that limit switches are all interlocked. Only attended station is number 5, where operator manually loads final flanger and controls automated line with pushbutton panel

Hotpoint Streamlines Bending and welding . . .

RAY F HERMANN, mgr, manufacturing engineering, HOTPOINT CO, MILWAUKEE

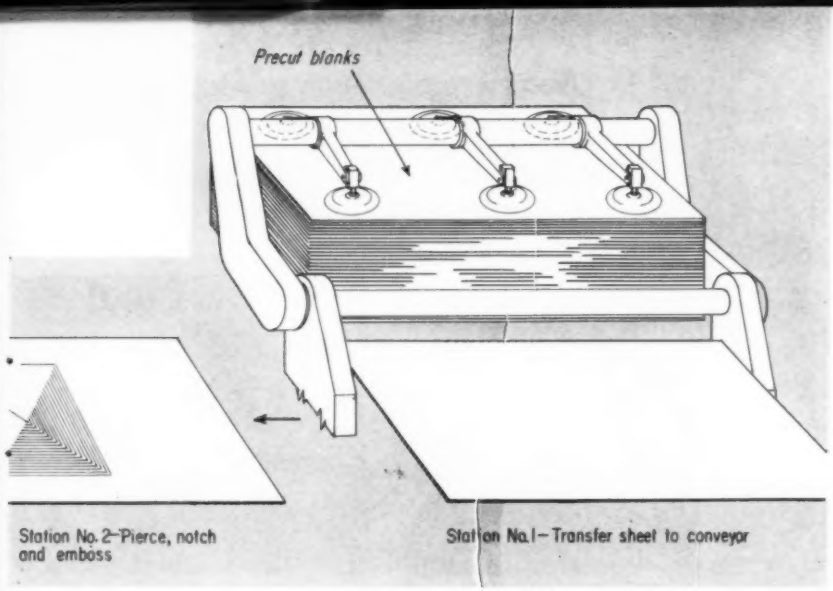
. . . and gains three advantages:

- Automated piercing, embossing, and bending where one operator controls the press line
- Mechanized resistance welding, possible because the part was redesigned, handled at five machines by three operators
- No more in-process inventories because production has been balanced so no storage is required

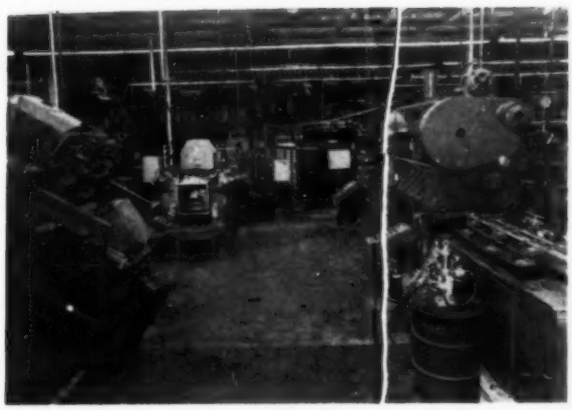
The U-shaped line produces tubs for new spinning dishwashers; current rate of production with 11 operators altogether is the same as with 35 operators a year ago.

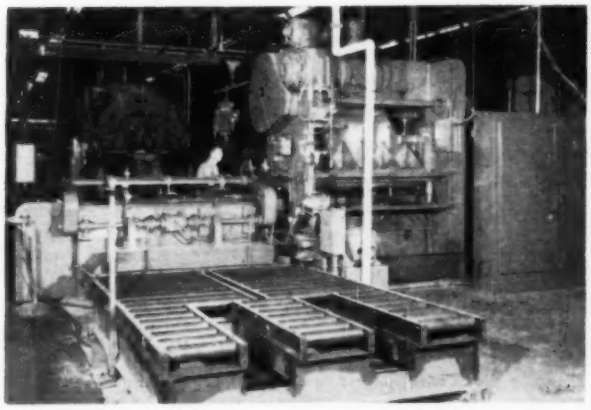
These results stemmed from cooperation between Hotpoint and Cyril Bath, which built the press equipment. Agreement was reached on both production and design levels, and the tub was redesigned to allow resistance welding instead of gas and arc welding, which would not formerly allow mechanization. The line includes automated stock handling between presses, piercing and embossing operations, and bending. Welding is completed on the second leg of the U.

Stock is pierced, notched, and embossed . . .
in Bath PT-6-150 mechanical press with hydraulically balanced ram. Gaging units insure that blank is centered properly before press can operate. Slugs are ejected downward to rear into easily removed containers

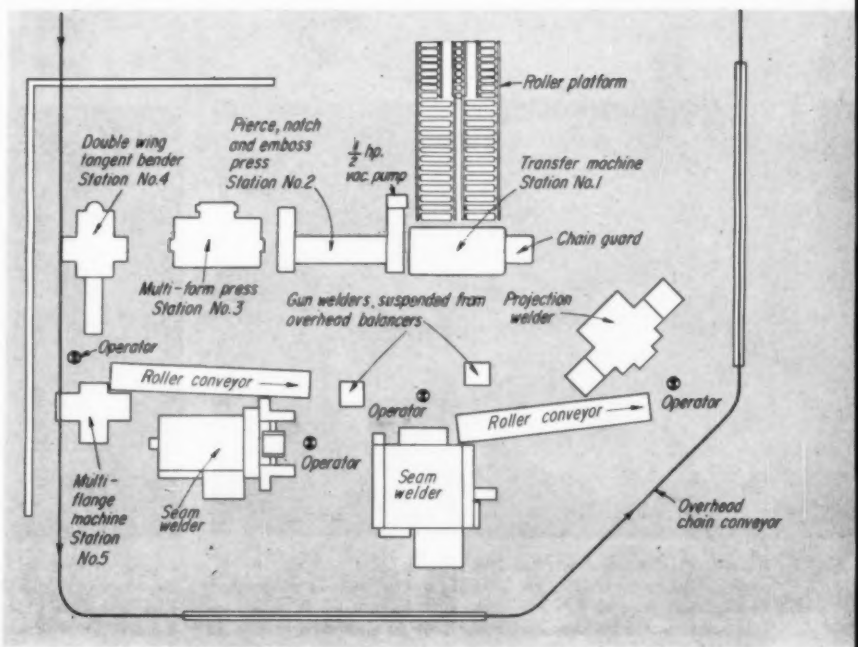


Blanks start from roller platform . . .
built to clear lift-truck forks when 4-ton bundles of stock are delivered. Pickup unit works with two arms that carry six suction cups. Middle cups are spring-loaded so they lag during pickup; sheet is peeled from both ends of stack before middle comes up

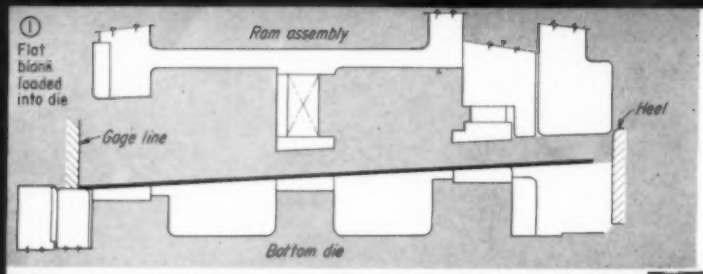


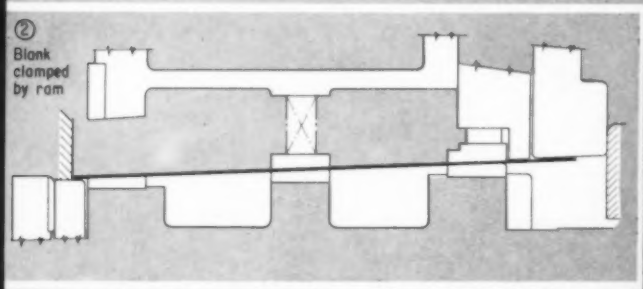


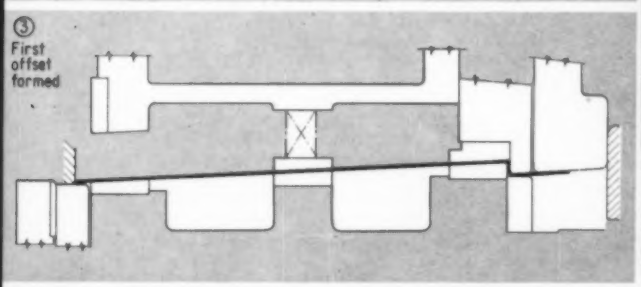
U-shaped forming and assembly line . . .
delivers a tub ready for enamel every 38 sec (above). Loader is far right, presses behind, and welders left. Line pierces, notches, embosses, flanges, and forms the tub sides and front, then adds a back, bottom, and brackets at gun and seam welders. Area covers less than 2200 sq ft (right). Welded tubs are removed to enamelling department by overhead chain conveyor

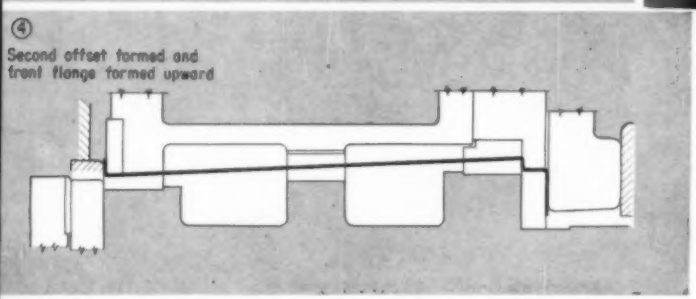


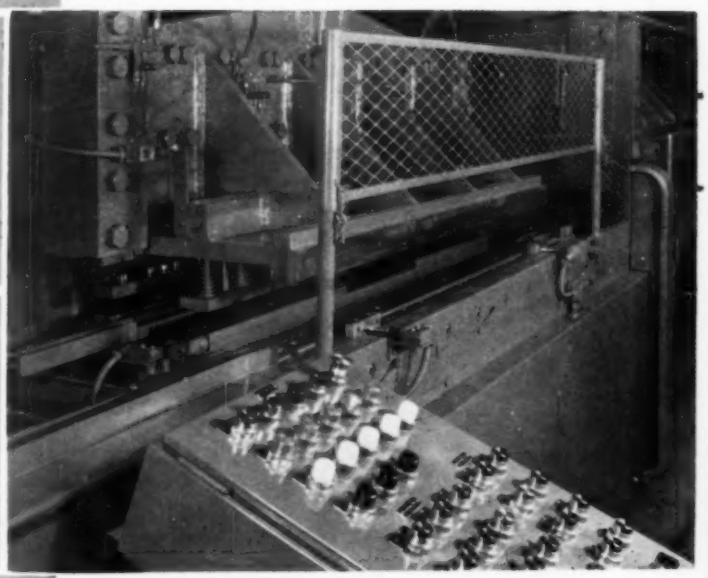
Hotpoint streamlines bending and welding—continued . . .



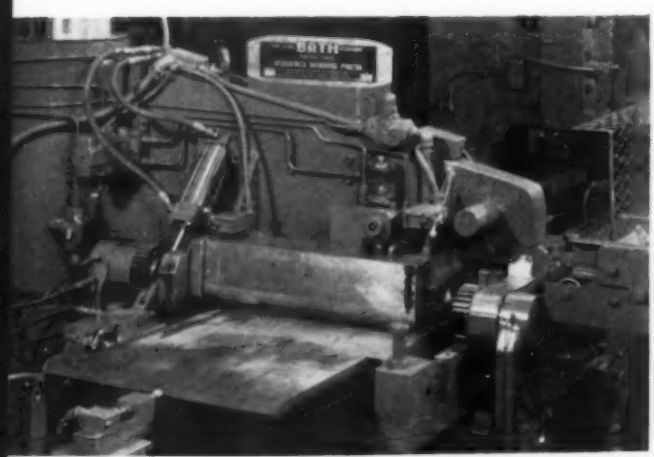


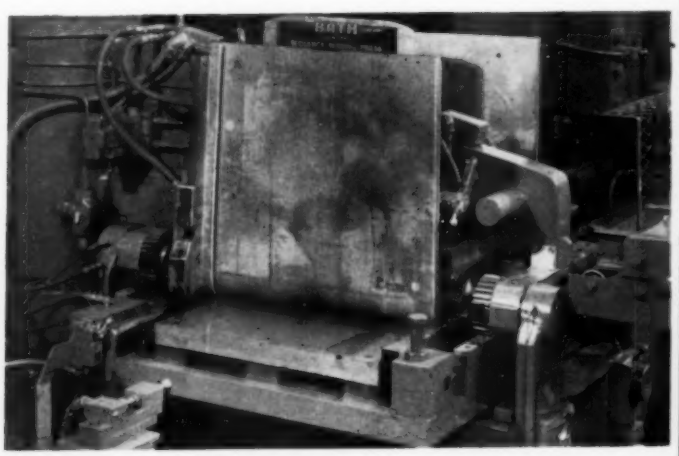




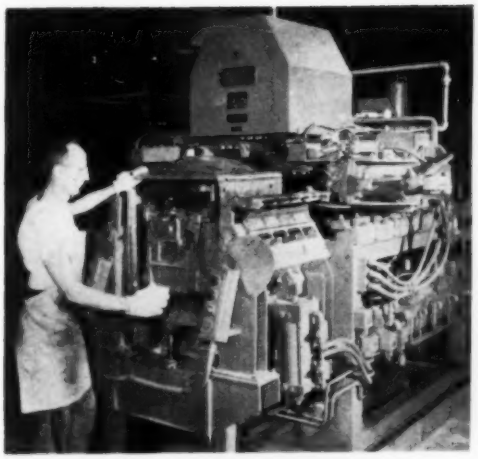


Double-acting draw die . . .
flanges pierced, notched, and embossed stock at station No. 3. Die is canted at 3° to overbend as ram wipes, to produce a single up flange in front, a double down flange at rear. Wear points and gage surfaces have hardened inserts. Control panel is tied into central interlocked controls, and is operated mainly for setup adjustments

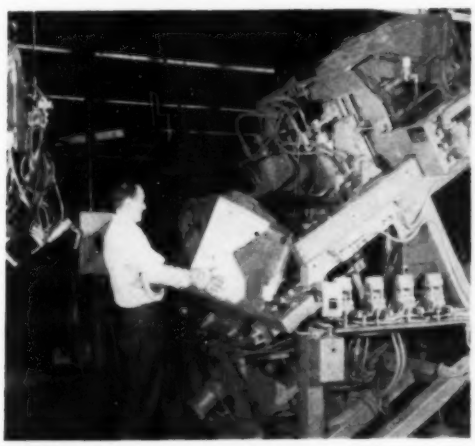




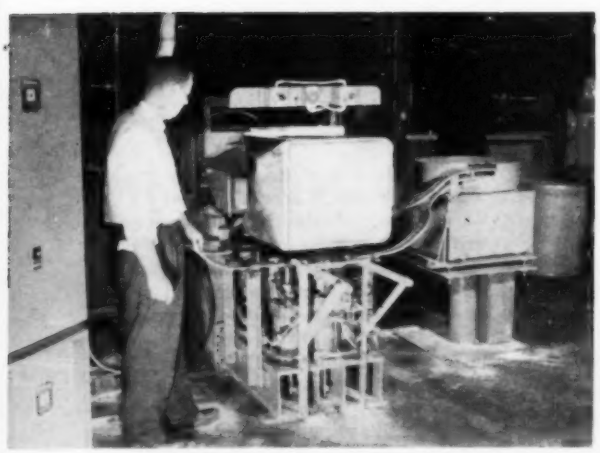
Tangent bender forms the blank . . .
into a U-shape at station No. 4. Single inside flange is compressed, while double outer flange is elongated about 60%. Corners are clamped square as they are bent. This is slowest operation in automated line, so rocker plates trip a limit switch to start the conveyor and initiate the next cycle. Meantime the punch is collapsed, the main ram raised, and a cylinder ejects the work onto a cradle for manual removal



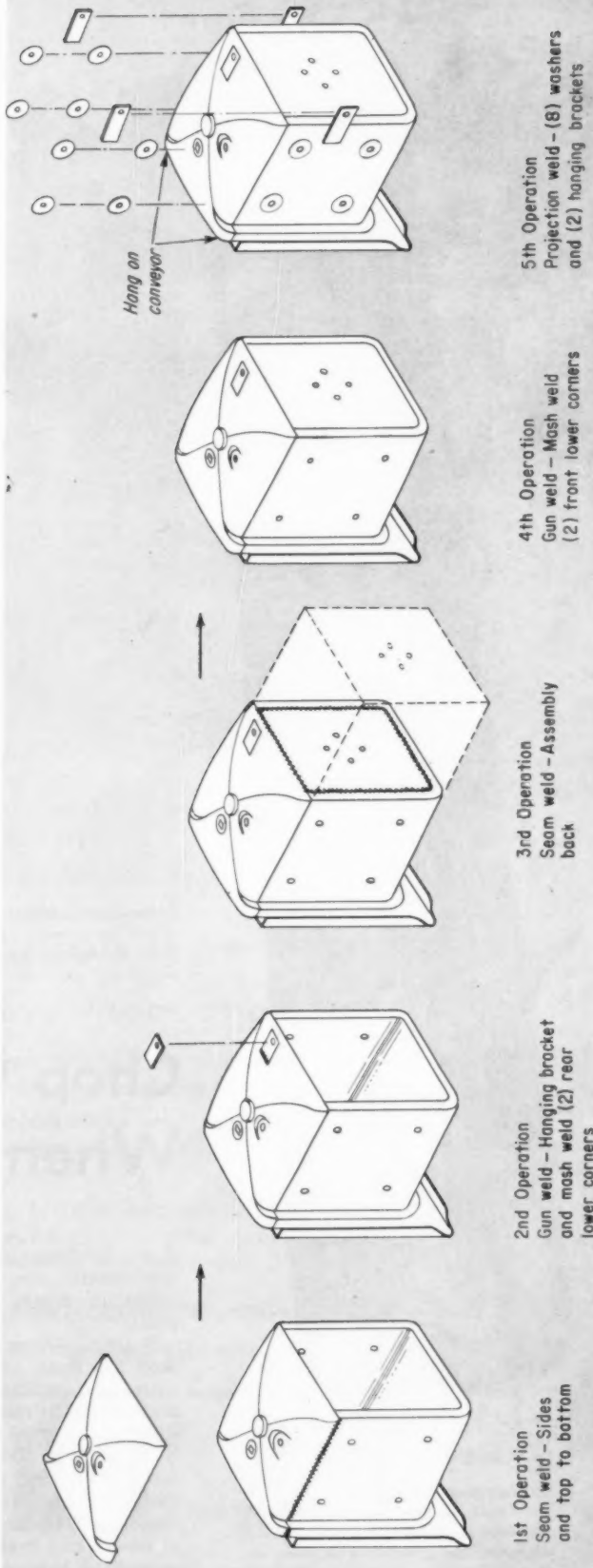
Seam welder joins formed U . . .
to bottom panel, feeding parts automatically. Operator also attaches hanging bracket and mash-welds two corners with overhead cable-supported gun



Backplate is seam-welded . . .
around four sides at United welder, which is loaded and unloaded manually

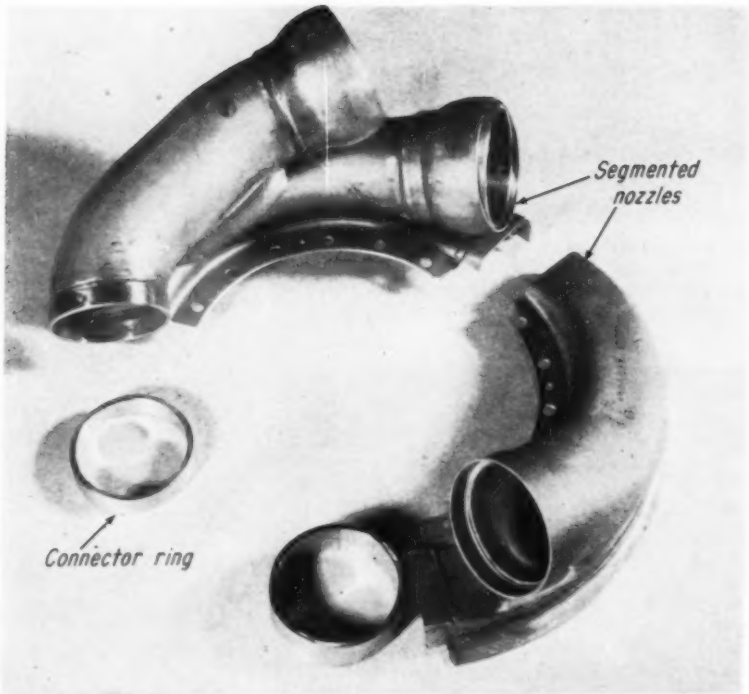


Projection welder assembles eight washers . . .
and two hanging brackets at end of tub-assembly line. Arco machine is automatic, served by Syntron feeder


Hang on conveyor
5th Operation
Projection weld – (8) washers and (2) hanging brackets
4th Operation
Gun weld – Mash weld (2) front lower corners
3rd Operation
Seam weld – Assembly back
2nd Operation
Gun weld – Hanging bracket and mash weld (2) rear lower corners
1st Operation
Seam weld – Sides and top to bottom

Five welding operations . . .
assemble formed tub to bottom, brackets, and back panel. Resistance welding replaces gas and arc welding, which eliminates grinding and cleanup operations

Connector rings . . .
were made in 15-in. lengths from N-155 alloy sheet by rolling, clamping, tackwelding, seam welding, grinding weld flush, and sizing. Now, 20-ft. long tubes are sawed into rings and deburred. Waste is sharply reduced



Segmented nozzles . . .
collect hot exhaust gases from the engine cylinders and deliver them to blow-down turbines. Connector rings join nozzle segments, must resist gases hotter than 1400 F and traveling at sonic velocities

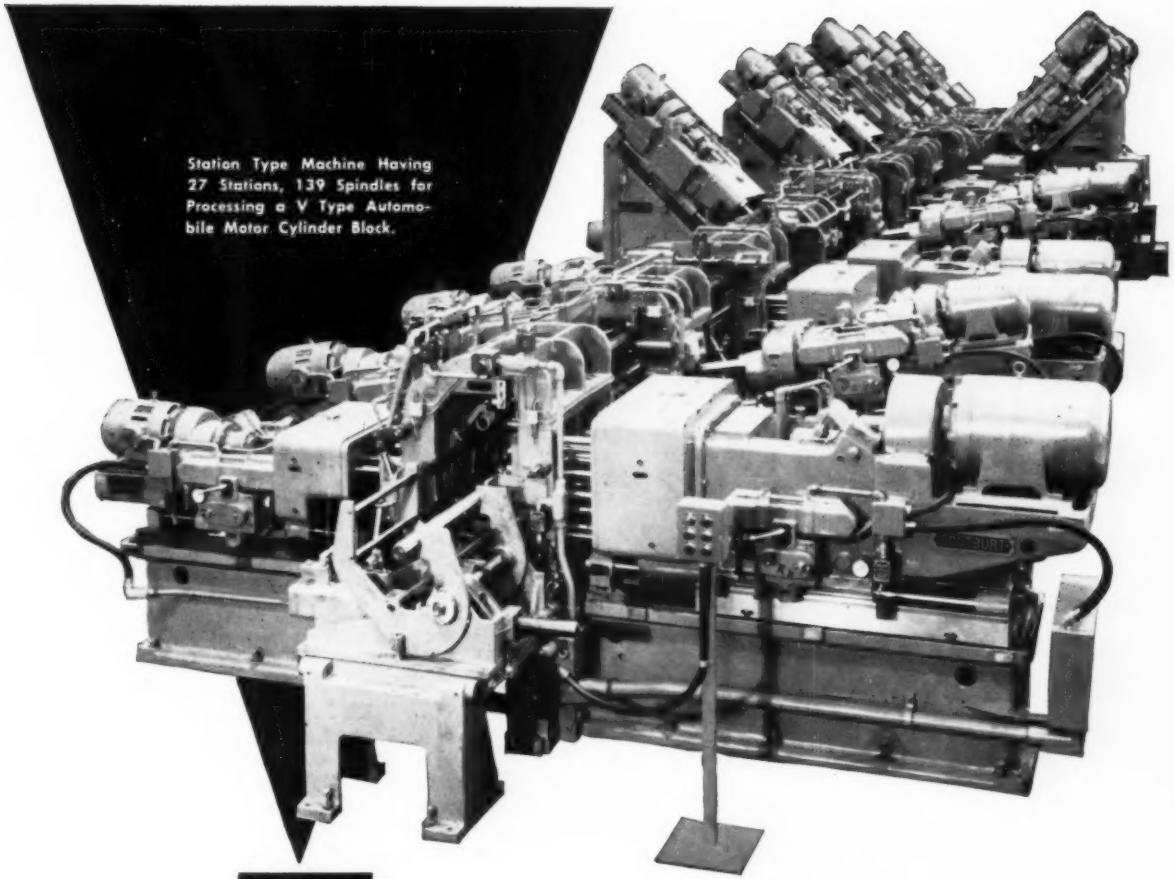
Chop Off the Pieces When You Can

A simple change in the form of your raw material can often produce remarkable savings. Here is a case in point:

Wright Aeronautical originally used flat stock to make connector rings from N-155 heat-resistant alloy. Available rolling and welding equipment limited the length of tube to 15 in. Scrap losses were high because tube ends were cropped to eliminate weld buildups and burn throughs. Machined rings often split at final sizing because of inclusions or voids in the seam weld.

Economies were achieved by switching to 20-ft lengths of welded N-155 tubing manufactured by the Alloy Tube Div, Carpenter Steel Co, Union, N J. Production steps were reduced to cutting off rings with a wet abrasive wheel and deburring. Material costs were also slashed because there is now virtually no waste and no splitting during sizing.

Savings mount fast because of the change from flat stock to mill-welded tubing. As many as 36 rings are used on the blowdown turbines for a 4-engine aircraft like the DC-7C. These turbines, three for each Wright EA turbo-compound engine, extract more than 20% additional power from the hot exhaust gases.



Station Type Machine Having 27 Stations, 139 Spindles for Processing a V Type Automobile Motor Cylinder Block.

FOOTBURT station type machines

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With the Station Type Machine, Footburt continues to provide the most modern developments in production machinery.

Drilling, reaming, tapping, milling, checking and testing may be combined in one station type machine, and units may be mounted at any angle.

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MACHINE TOOLS

Tool Steel Topics

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BTR blanking die trims costs of power mower parts

This is part of a blanking die, made of BTR tool steel, which was manufactured recently by American Machine & Tool Co., Minneapolis, for use in forming a sheet-steel foot rest for a power mower.

"We first discussed the job with Paper Calmenson and Company, Bethlehem's local tool steel distributor," said one of American's engineers. "Their recommendation was BTR . . . because it's safe-hardening, tough, and has plenty of resistance to wear. It was a good choice. The die performed well, and our costs were kept low."

BTR (Bethlehem Tool Room) is our general-purpose, manganese-chromium-tungsten grade of oil-hardening tool steel. Time after time it gives long service, and trims down those production costs. That's why manufacturers keep coming back for more, and for a wide range of applications.

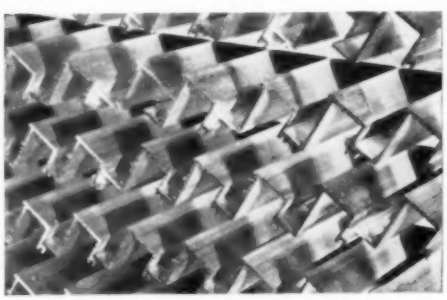
If you haven't yet experienced the advantages of BTR in your shop, why not order enough for a trial run from your Bethlehem tool steel distributor? It's one of the wisest moves you can make. Give him a call right now, while you have it in mind.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Letter Stamping Should Be Avoided

Many tools are stamped with number or letter die-stamps for identity, or to incorporate such information as size. But stamped impressions introduce sharp notches which serve to concentrate stresses both in the hardening operations and in service, and cause many service failures which would not have occurred in the absence of stamping. It is impossible to predict which stamped characters will cause trouble due to cracking. Often identical stamped tools develop little or no cracking through stamped characters, while duplicate lots may show a high percentage of such cracking.

Avoiding the use of stamped characters in tools and dies will be found to improve the service life, if a statistically large group of tools is studied. This result does not always occur on single tools, nor on a small number of tools. Yet there is no doubt that the elimination of stamping benefits tool life. In the light of present-day knowledge of the effects of stress concentration, it is intolerable that such stress-raisers as stamp marks be put on tools and dies intentionally. Stamping of characters can be avoided by resorting to the use of paint, labels, etching, or "electric pencil" to place the necessary information on the tool surfaces.

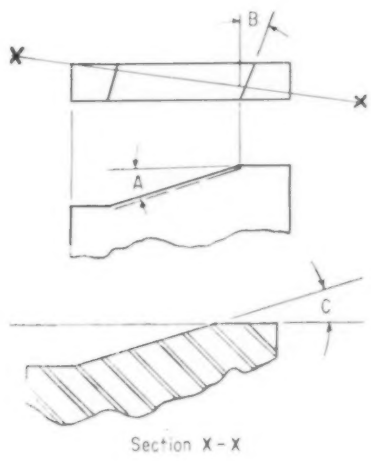


PATTERN IN EXTRUSIONS. These long metal extrusions, made by American Aluminum Extruders, Miami, were formed with a die of Cromo-WV. This grade, with its .30 pct vanadium content, is a modification of Cromo-W, our general purpose hot-work steel. Cromo-WV is an excellent tool steel grade for extrusion work because it has a well-balanced combination of properties: wear resistance, red hardness, and shock resistance, plus resistance to heat-checking.

CIRCLE 243 READER SERVICE CARD

Quick Solution of Compound Angles

D E SWEET



Section X - X

True angle *C* can be found by projection and trigonometry, but a quicker solution is possible by use of Tables I and II. The result will be accurate to the nearest minute.

Table I supplies three constants, two for angle *A* and one for angle *B*. Table 2 lists quantities for each minute of a degree up to 9°.

To find true angle *C*:

1. Multiply Constant 1 for angle *A* (Col 2, Table 1) by the constant for angle *B* (Col 3, Table 1.)

2. From the result, subtract Constant 2 for angle *A* (Col 4, Table 1).

3. Find the value so obtained in Table 2 and read the corresponding degrees and minutes.

4. Add these figures to angle *A* to determine true angle *C*.

Example:

If *A* = 15°, and *B* = 10°
Step 1—4.00 x 65.8 = 263.2 (Constant 1 for *A* times Constant for *B*)
Step 2—263.2 - 3.73 = 259.47 (Step 1 minus Constant 2 for *A*)
Step 3—0°13′ corresponds to quantity 259.47 in Table 2
Step 4—True angle *C* = 15° + 0°13′ = 15°13′

TABLE I

1	2	3	4
ANGLES A & B (DEG.)	CONSTANT 1 FOR A	CONSTANT FOR B	CONSTANT 2 FOR A
1	57.3	6666.	57.3
2	28.7	1639.	28.6
3	19.1	730.	19.1
4	14.4	410.	14.3
5	11.5	262.	11.43
6	9.62	182.	9.51
7	8.27	134.	8.14
8	7.25	103.	7.11
9	6.47	81.3	6.31
10	5.85	65.8	5.67
11	5.34	54.3	5.14
12	4.92	45.6	4.70
13	4.56	38.9	4.33
14	4.26	33.6	4.01
15	4.00	29.3	3.73
16	3.77	25.8	3.49
17	3.58	22.9	3.27
18	3.40	20.4	3.08
19	3.25	18.3	2.90
20	3.11	16.6	2.75
21	2.99	15.1	2.60
22	2.88	13.7	2.47
23	2.78	12.6	2.35
24	2.69	11.5	2.25
25	2.61	10.7	2.14
26	2.54	9.88	2.05
27	2.47	9.17	1.96
28	2.41	8.55	1.88
29	2.36	7.99	1.80
30	2.31	7.46	1.73
31	2.26	6.99	1.66
32	2.22	6.58	1.60
33	2.19	6.21	1.54
34	2.16	5.85	1.48
35	2.13	5.52	1.43
36	2.10	5.24	1.37
37	2.08	4.97	1.33
38	2.06	4.72	1.28
39	2.04	4.48	1.23
40	2.03	4.27	1.19
41	2.02	4.08	1.15
42	2.01	3.89	1.11
43	2.00	3.72	1.07
44	2.00	3.56	1.03
45	2.00	3.42	1.00

TABLE II

MINUTES	DEGREES								
	0°	1°	2°	3°	4°	5°	6°	7°	8°
1	3437.	56.3	28.40	18.97	14.24	11.39	9.488	8.125	7.100
2	1719.	55.4	28.17	18.87	14.18	11.35	9.461	8.105	7.085
3	1146.	54.5	27.94	18.77	14.12	11.31	9.435	8.086	7.071
4	859.	53.7	27.71	18.66	14.06	11.28	9.409	8.067	7.056
5	687.	52.9	27.49	18.56	14.01	11.24	9.383	8.048	7.041
6	573.	52.1	27.27	18.46	13.95	11.20	9.357	8.028	7.026
7	491.	51.3	27.06	18.36	13.89	11.17	9.331	8.009	7.012
8	430.	50.55	26.84	18.27	13.84	11.13	9.306	7.991	6.997
9	382.	49.82	26.64	18.17	13.78	11.09	9.281	7.972	6.983
10	344.	49.10	26.43	18.07	13.73	11.06	9.255	7.953	6.968
11	312.	48.41	26.23	17.98	13.67	11.02	9.230	7.934	6.954
12	286.	47.74	26.03	17.88	13.62	10.99	9.205	7.916	6.939
13	264.	47.08	25.83	17.79	13.56	10.95	9.180	7.897	6.925
14	245.	46.45	25.64	17.70	13.51	10.92	9.155	7.879	6.911
15	229.	45.83	25.45	17.61	13.46	10.88	9.131	7.861	6.897
16	215.	45.23	25.26	17.52	13.40	10.85	9.106	7.842	6.883
17	202.	44.64	25.08	17.43	13.35	10.81	9.082	7.824	6.869
18	191.	44.07	24.90	17.34	13.30	10.78	9.058	7.806	6.855
19	181.	43.51	24.72	17.25	13.25	10.74	9.034	7.788	6.841
20	172.	42.96	24.54	17.17	13.20	10.71	9.010	7.770	6.827
21	163.	42.43	24.37	17.08	13.14	10.68	8.986	7.752	6.813
22	156.	41.92	24.20	17.00	13.09	10.64	8.962	7.735	6.799
23	149.	41.41	24.03	16.91	13.04	10.61	8.939	7.717	6.786
24	143.	40.92	23.86	16.83	12.99	10.58	8.915	7.700	6.772
25	137.	40.44	23.69	16.75	12.95	10.54	8.892	7.682	6.758
26	132.	39.96	23.53	16.67	12.90	10.51	8.869	7.665	6.745
27	127.	39.51	23.37	16.59	12.85	10.48	8.845	7.647	6.731
28	123.	39.06	23.21	16.51	12.80	10.45	8.822	7.630	6.718
29	118.	38.62	23.06	16.43	12.75	10.42	8.799	7.613	6.704
30	115.	38.19	22.90	16.35	12.70	10.38	8.777	7.596	6.691
31	111.	37.77	22.75	16.27	12.66	10.35	8.754	7.579	6.678
32	107.	37.36	22.60	16.19	12.61	10.32	8.732	7.562	6.665
33	104.	36.96	22.45	16.12	12.56	10.29	8.709	7.545	6.651
34	101.	36.56	22.31	16.04	12.52	10.26	8.687	7.528	6.638
35	98.2	36.18	22.16	15.97	12.47	10.23	8.665	7.511	6.625
36	95.5	35.80	22.02	15.89	12.43	10.20	8.643	7.495	6.612
37	92.9	35.43	21.88	15.82	12.38	10.17	8.621	7.478	5.599
38	90.5	35.07	21.74	15.75	12.34	10.14	8.599	7.461	6.586
39	88.1	34.71	21.61	15.67	12.29	10.11	8.577	7.445	6.573
40	85.9	34.37	21.47	15.60	12.25	10.08	8.555	7.429	6.560
41	83.8	34.03	21.34	15.53	12.21	10.05	8.534	7.412	6.548
42	81.8	33.69	21.20	15.46	12.16	10.02	8.513	7.396	6.535
43	79.9	33.37	21.07	15.39	12.12	9.990	8.491	7.380	6.522
44	78.1	33.04	20.95	15.32	12.08	9.960	8.470	7.364	6.510
45	76.4	32.73	20.82	15.26	12.03	9.931	8.449	7.348	6.497
46	74.7	32.42	20.69	15.19	11.99	9.902	8.428	7.332	6.484
47	73.1	32.12	20.57	15.12	11.95	9.873	8.407	7.316	6.472
48	71.6	31.82	20.45	15.05	11.91	9.845	8.386	7.300	6.460
49	70.1	31.53	20.32	14.99	11.87	9.816	8.365	7.284	6.447
50	68.7	31.24	20.20	14.92	11.82	9.788	8.345	7.269	6.435
51	67.4	30.96	20.09	14.86	11.78	9.760	8.324	7.253	6.422
52	66.1	30.68	19.97	14.79	11.74	9.732	8.304	7.237	6.410
53	64.8	30.41	19.85	14.73	11.70	9.704	8.284	7.222	6.398
54	63.6	30.14	19.74	14.67	11.66	9.677	8.263	7.207	6.386
55	62.5	29.88	19.63	14.61	11.62	9.649	8.243	7.191	6.374
56	61.4	29.62	19.51	14.54	11.58	9.622	8.223	7.176	6.362
57	60.3	29.37	19.40	14.48	11.54	9.595	8.203	7.161	6.350
58	59.3	29.12	19.30	14.42	11.51	9.568	8.184	7.145	6.338
59	58.2	28.88	19.19	14.36	11.47	9.541	8.164	7.130	6.326
60	57.3	28.64	19.08	14.30	11.43	9.514	8.144	7.115	6.314

only Vlier HEXNOSE spring plungers can be installed with an ordinary end wrench!

Hexagonal nose eliminates need for spanner-type wrenches; speeds insertion, adjustment and removal!

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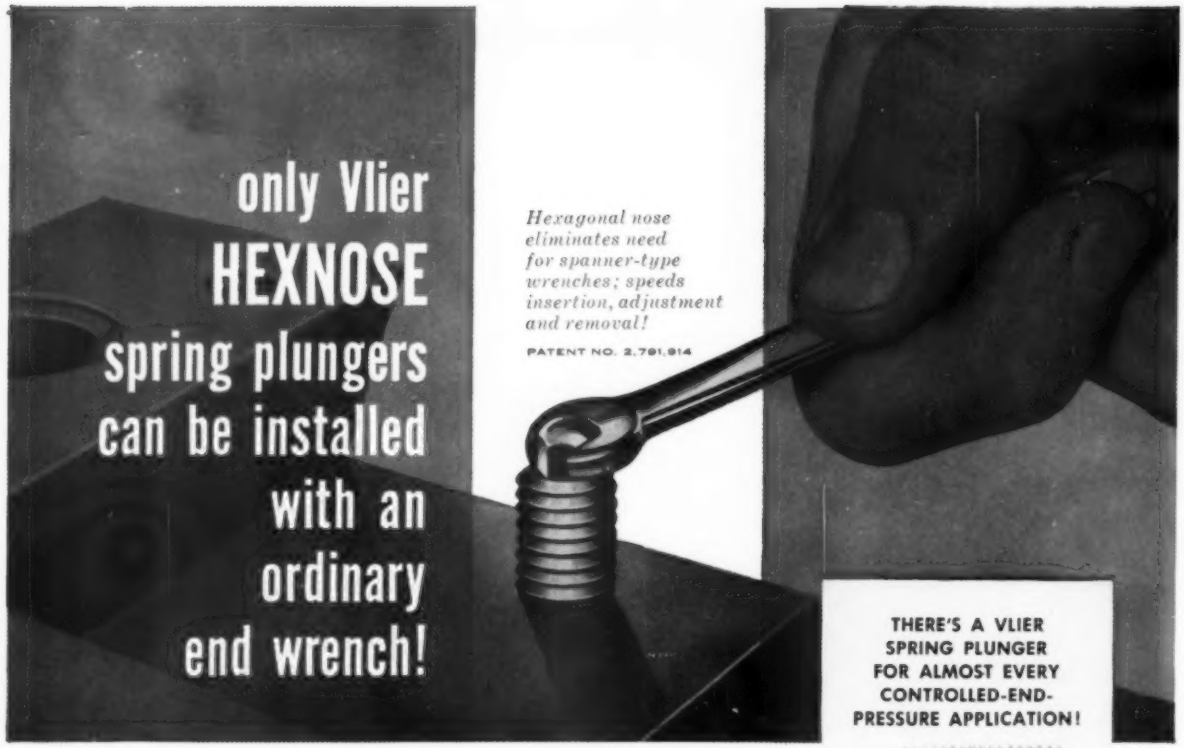
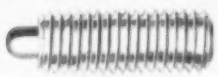


Whatever your spring plunger application—tooling or original equipment—you'll like the ease and speed with which Vlier Hexnose Spring Plungers can be installed.

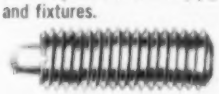
No more hunting for clumsy-to-use spanner-type wrenches or special screw drivers—any ordinary end, socket or crescent-type wrench will do the job quickly and easily.

Since the plunger nose is always easily accessible, the Hexnose really pays off where periodic adjustments must be made. Hardening both body and plunger assures body life. Available in both standard and light end pressure models; 11 sizes.

THERE'S A VLIER SPRING PLUNGER FOR ALMOST EVERY CONTROLLED-END-PRESSURE APPLICATION!



Standard
Primarily used in ordinary jigs and fixtures.



Silvernose
Light end pressure for repetitive die applications.

Plastic Nose
For use with aluminum, brass and other soft materials.

Hexnose
For greater ease in installing, adjusting and removing.

Same sturdy construction as other Vlier spring plungers

1. Large bearing surface overcomes binding, assures perfect alignment of the plunger at any extension.
2. Concentricity between plunger axis and body diameter held to .0015" T.I.P.R.
3. Rust-proof finish and National Coarse Class 2A threads prevent freezing in threaded hole.
4. Plunger end telescopes completely within body. Case-hardening assures extreme wear resistance. Ductile core overcomes brittleness and hazards of fracturing under impact, common with hardened, high carbon steels.
5. Spring pressures are accurate, uniform and dependable.
6. Accurately radiused nose speeds loading and unloading of jigs and fixtures.

American Machinist
REFERENCE BOOK SHEET

Nomogram for Punch Length – I

RUDOLPH GRUENBERG, Equipment Engineering Dept,
WESTINGHOUSE LAMP DIV, BLOOMFIELD, N J

Failure of thin punches is generally attributable to three conditions: (1) faulty material—either as supplied by the mill or from improper quenching; (2) incorrect stripping — subjecting the punch to destructive bending moments; (3) improper design—the punch is too slender for the thickness of the metal to be pierced and the diameter of the hole. Because the last condition is often neglected, the nomogram on page 95 was developed for convenient checking of punch dimensions. Calculations so made agree closely with shop practice.

In complicated progressive dies, punch breakage is expensive and a cause of interrupted production. Therefore, it is imperative that the ability of thin punches to withstand buckling be accurately evaluated.

Because a punch is a column, Euler's formulas are applicable. The strength of a column is in part dependent on the end conditions, by which is meant the degree of end constraint. A punch may be considered a column with one end fixed and the other end laterally supported by a bushing located in the stripper. In the strict theoretical sense, however, neither end can be considered "fixed." We are justified, therefore, in considering a punch as a "round-ended" column, although in practice true round-ended columns never occur. The actual conditions, therefore, are almost always intermediate.

If a punch is treated as a round-ended column, a safety factor is introduced to compensate for shock loading. Further, some assumptions underlying the Euler formulas are not always realized in practice (homogenous material, uniform cross section, perfect straightness, and truly central application of the punch force).

Euler's formula for a "round-ended" column is

$$P = \frac{\pi^2 EJ}{L^2} \qquad (1)$$

where: P = pressure in pounds
E = modulus of elasticity
J = moment of inertia
L = length of column

If the punch is to stand up under the piercing pressure, then this force cannot be larger than P in equation (1). We can therefore write:

$$D\pi TS_H = \frac{\pi^2 EJ}{L^2} \qquad (2)$$

where: D = diameter of hole
T = thickness of metal to be pierced
S_H = shear strength of metal
L = length of punch

For round punches $J = \frac{\pi D^4}{64}$ and $E = 11800000$ for hardened tool steel. When these values are introduced into equation (2) and we solve for L, we obtain the maximum punch length.

$$L_{MAX} = \sqrt{\frac{1{,}820{,}000\ D^3}{S_H T}} \qquad (3)$$

The ratio of shear strength to tensile strength depends upon composition and temper, and ranges from 0.5 to 0.8 for all metals. Because dulling of the cutting edges imposes an additional load on the punch, the higher ratio is recommended.

This enables us to introduce the tensile strength S, which is readily available from handbooks, into equation (3). We thus obtain the equation for maximum length:

$$L_{MAX} = \sqrt{\frac{2{,}275{,}000\ D^3}{ST}} \qquad (4)$$

This equation, upon which the nomogram is based, contains only the hole diameter, D; the metal thickness, T; and the tensile strength, S.

Naturally, use of this nomogram alone will not permit a successful design. A generous and clean fillet must, of course, be provided to avoid stress concentrations.

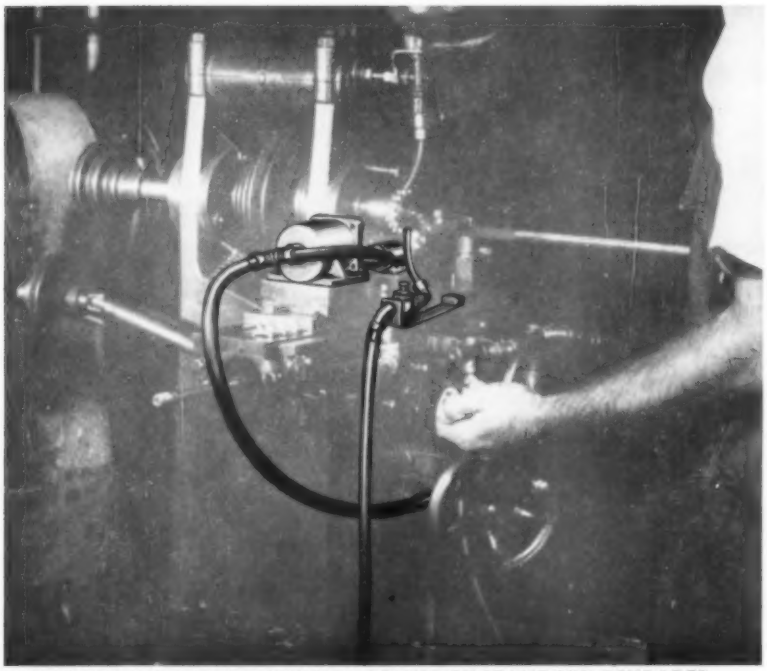
Procedure for Using Chart, p95

1. Connect proper values of S (tensile strength) and T (metal thickness) with straight line I, thus establishing a pivot point on the pivot line.

2. From pivot point draw straight line II to proper value for hole diameter, D.

3. At point at which line II intersects scale for maximum length, L_{max}, find the maximum punch length.

TAILOR YOUR OWN AUTOMATIC FIXTURES WITH STANDARD SCHRADER AIR PRODUCTS



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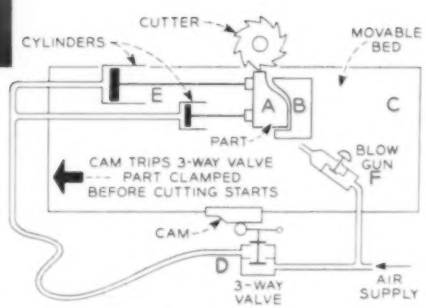
ANOTHER TYPICAL SHOP PROBLEM SOLVED BY STANDARD SCHRADER PARTS: Tiny parts required accurate milling. But how could operators hold them in position, mill them, and keep the area clean of scrap... and still maintain production? Operator places part A in jig B and moves carriage C to right. Normally open 3-way valve D actuates clamping cylinders E, holding them in position for milling. When part is milled, carriage is returned, which exhausts valve D to atmosphere and releases cylinders E. Part is removed from jig and a tap of button on blowgun F clears area of chips.

RESULT: Production speeded. Increased accuracy. Decreased operator fatigue.



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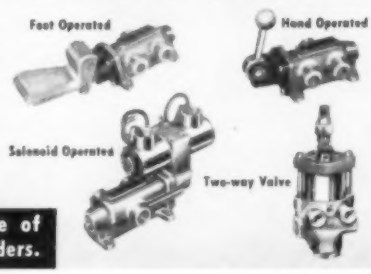
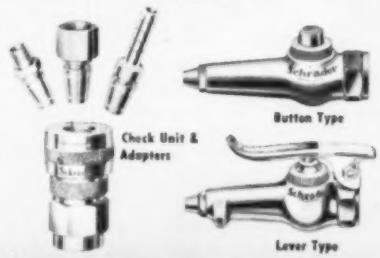


AIR ACCESSORIES



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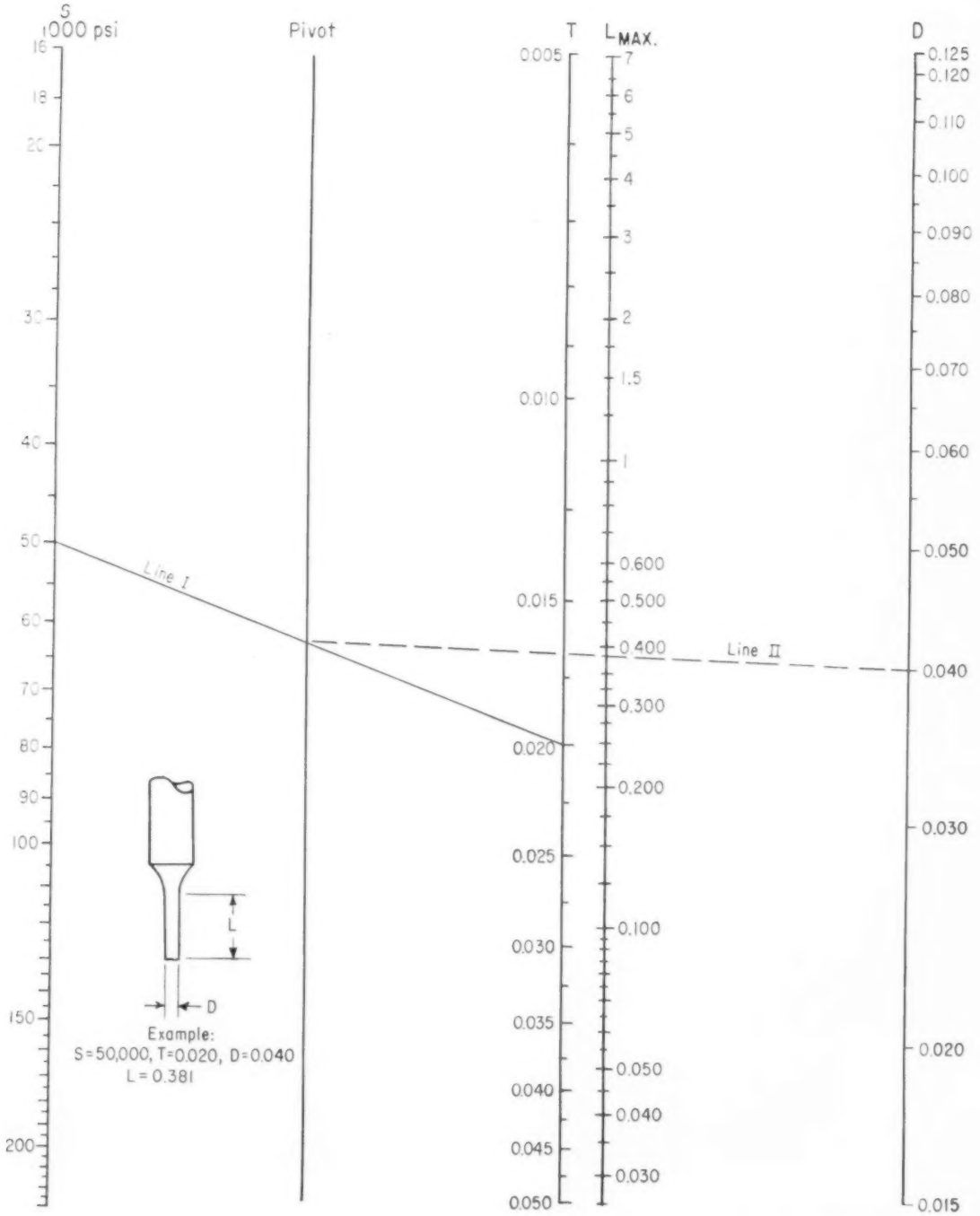
Nomogram for Punch Length – II



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Talking Shop...

New Look at Business

OUR STATISTICIANS in the McGraw-Hill Dept of Economics have discovered a startling similarity between the rise and fall of the hemline and the business cycle (see chart at right). Thus the rising hemlines today forecast better business ahead for metalworking. There are, as always, two schools of thought on this. One says that business follows the hemline, the other that the hemline follows business. Either way, our advisors say that there will be minor fluctuations in the hemline and the economy, but neither will plunge. As both a man and a businessman, we're glad.

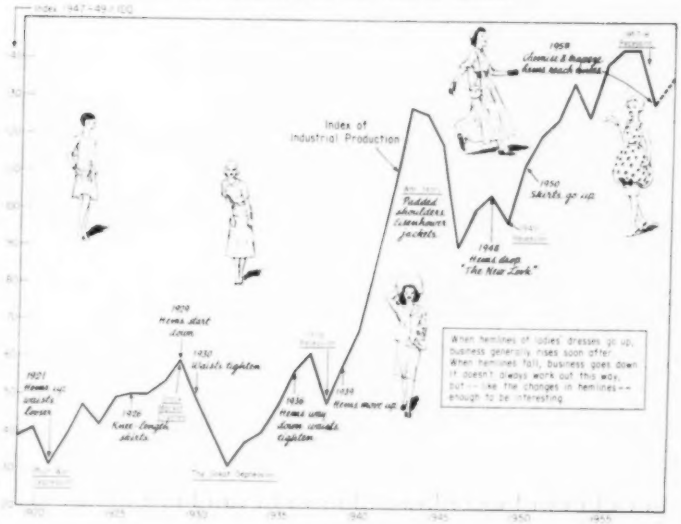
Science vs Engineering

SYMBIOTIC INTERACTION was the title given to a discussion of the relationship between science and engineering in a recent paper by Gerhart Groetzinger of the Research Institute for Advanced Studies. (The title refers to mutual advantages in association of different groups.) It is a thoughtful paper and repays rereading. We think you'll be interested in the author's view of the function of the scientist and the engineer. Science consists of two parts: theoretical and experimental. In one branch, the scientist collects significant observations; in the other he constructs theories from which it would be possible to predict the experimental results. On the other hand, it is the task of engineering to manipulate the material universe in such a fashion as to provide for the fulfillment of human needs and desires. Groetzinger is at some pains to point out that he doesn't mean that the engineer merely works with formulas developed by scientists. He says, giving us perhaps more than our due, that the raw material supplied by science plays the same role as words for a poet.

Bearing Salvage

EASTMAN KODAK can put 62% of used anti-friction bearings back into service, according to Cort Miller, founder of the company's bearing test center. As reported by Armour Research Foundation, the method is to clean the bearings in a solvent bath, remove dirt with ultrasonic vapor degreaser, then test physical dimensions. Finally the bearing is mounted on a spindle and rotated under load, checked with a vibration meter or accelerometer.

HOW HEMLINES CALL THE TURN IN BUSINESS


Index of Industrial Production
1921 Hems up, waists lower
1925 Knee length skirts
1929 Hems start down
1930 Waists tighten
1936 Hems way down, waists tighten
1939 Hems move up a bit
1948 Hems drop "The New Look"
1950 skirts go up
1958 Hemlines & business reach bottom
When hemlines of ladies' dresses go up, business generally rises soon after. When hemlines fall, business goes down. It doesn't always work out this way, but the changes in hemlines — enough to be interesting.

MEMOS

by BESS RITTER

Iron nails have actually been used, all over the world, for curing all kinds of illnesses in the belief that they could be "nailed down:"

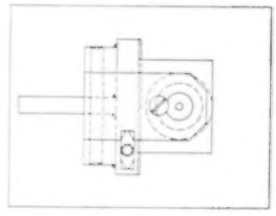
In Herts, England, there was once a row of oak trees that bristled with hundreds of nails, hammered in by people who thought this would cure the ague for them: The remedy consisted of nailing a few strands of the patient's hair to the tree, then wrenching them away with a sudden motion of the head. The disease, it was thought, would attach itself to the nail.

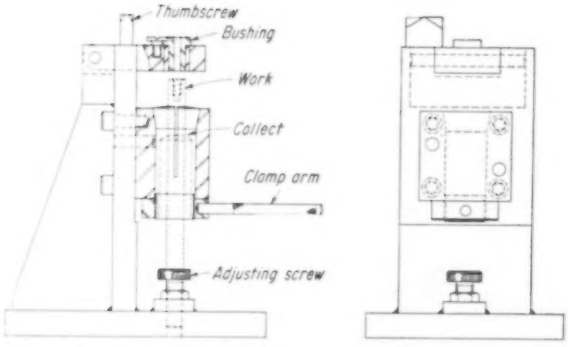
In Suffolk, England, ague sufferers took iron nails with them at midnight to a crossroads. Here they believed the malady would be cured by simply turning around three times, driving a nail into the ground below the feet, and walking away from the spot backwards, before the clocks finished striking twelve. Again the illness would be absorbed into the metal.

In Cairo, Egypt, even up until comparatively recent times, it was considered far more effective to cure a headache by driving a nail into a wooden panel than it was to swallow an aspirin. A favorite "nailing place" was the door of the Cairo South Gate.

Similar nailing customs, with variations, were practiced in other lands as well, including Mogador, North Africa, Tunis, North Africa, and Port Charlotte, New Brunswick. As a matter of fact, this practice really dates back to the ancient Romans, when one of the "greatest of them all," the venerated Pliny, advised this cure for epilepsy: Wait until the sufferer falls to the ground, after an attack. Then hammer a nail into this spot.

Practical Ideas...





Adjustable Jig Grips Rods For End Drilling, Tapping

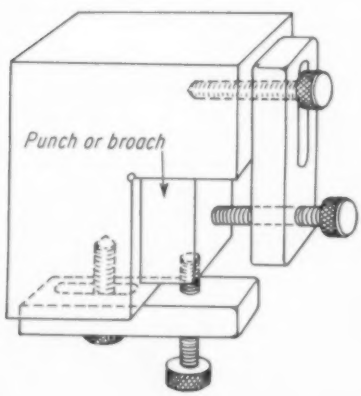
Short rods can be end-drilled and tapped in this welded-up jig, which holds stock in standard screw-machine collets. The jig has vertical adjustment to handle a wide range of rod lengths, and can take collets of 61 different sizes (1/16 to 1 in.) to hold stock for chamfering and other operations as well.

Standard replaceable slip bushings are mounted in a swing-leaf plate mounted at the top. This has a thumbscrew lock that prevents the leaf from moving when a tool is working.

The collet holder is a block dowelled and screwed to the jig upright, then bored in line with the bushing holder for accuracy. A threaded collar at the bottom of the block draws up the collets so they clamp the work securely. Leverage is provided by a clamp arm.

The base includes a boss drilled to accept an adjusting screw that will support the rod stock at proper height for drilling. The jig will also clamp square stock up to 11/16 in. and hex stock to ⅞ in.

Roger Isetts, Kenosha, Wis



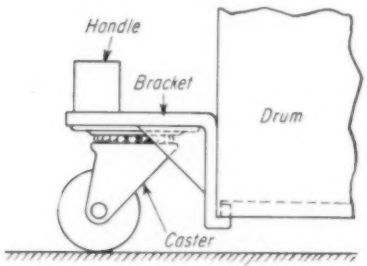
Holding Block Guides Punches

The illustrated tool is used to position and squarely guide a punch while it is being sheared into a die. Though this is its primary function, it has been used to guide square broaches and also to hold small parts for surface grinding and drilling.

Construction of the tool is simple, but attention should be given to producing surfaces accurately square in relation to each other. The performance of the tool will reflect its accuracy.

The block is made from tool steel which is, after preliminary machining, hardened and ground all over. Two adjustable straps with camping screws hold the work against the square inside faces of the block.

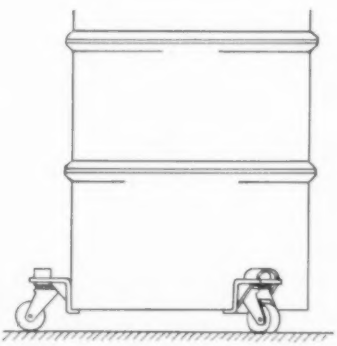
Howard Levy, Brooklyn, NY



Casters Ease Drum Handling

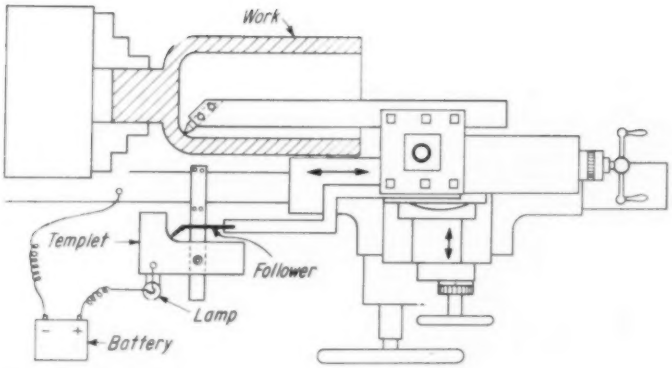
The casters shown are used in our shop to move 55-gallon steel drums about. Loaded drums are safer on these casters than on a hand truck. It is also easier to apply the casters than it is to lift a drum up on a dolly.

These caster units consists of swivel casters welded to angle hook-on brackets. The brackets are bent up from steel plate to form an angle and hook, as shown, and to conform with the radius of the drum edge. Gussets are welded into the corners of the angle for reinforcement. A piece of strap steel is bent and welded to the top of the bracket to form a handle.



To place the caster under the drum, a workman slips his toe into the handle of the caster. He then tips the drum away from himself, placing the hook under the edge as the drum is again lowered. Fully loaded drums may require the aid of an assistant to put the casters in place.

Ernest Jones, Bronx, NY



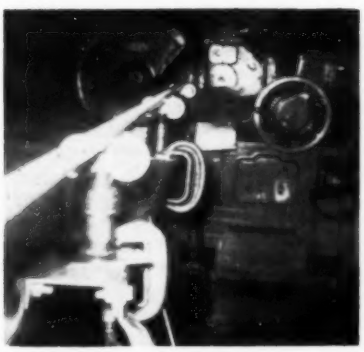
Electric-Light Setup Helps Lathe Follow Templet

Here's a way to do copying work without a real copying lathe. It requires a lathe with good saddle and slide bearings, plus a battery, wire, and a lamp.

The templet is fastened to the lathe bed with a non-conducting strap of some kind. A metal follower is attached to the lathe carriage. Then the battery-lamp hookup is made between the lathe bed and the templet so the lamp will light only when the follower touches the templet.

This beats following a templet entirely by eye, because the flashing lamp is much easier to see and it gives a sensitive indication when the follower touches the templet. Templets are usually made from ⅛-in. sheet stock.

S Stein, Haifa, Israel



Outboard Support Extends Capacity of Grinder

Jobbing shops sometimes find themselves without a choice but to take on jobs larger than they are equipped for. Such was the case recently when we had to grind 3½-in.-dia bar stock 20 ft long, holding a total tolerance of 0.002 in.

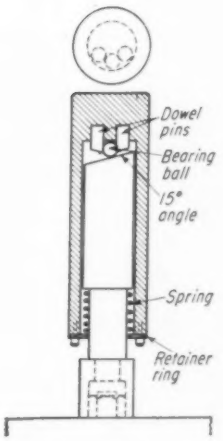
To enable us to fulfill our commitment, the illustrated outboard support fixture was designed and built. It was made from inexpensive parts found lying around the shop, and was easy to attach to or remove from the grinder.

In detail, the fixture consists of a channel iron to which castered legs are attached. The casters allow the fixture to move with the motion of the machine slide. Two bolts secure one end of the channel iron to the lower slide of the centerless grinder.

The roller assemblies which mount on the channel iron are made from discarded ball bearings bushed up with aluminum sleeves. Each pair of ball-bearing rollers is mounted in clevises on a threaded stud. A ball-thrust bearing between the adjustment nut and the pipe stand makes up-and-down adjustments easy. C-clamps are employed to secure the assemblies to the channel iron.

Once the feed has been established and upper rollers locked in place, the regulating wheel feeds the stock through the machine. The complete unit has enough flexibility to permit grinding stock that is not perfectly straight, and yet rigid enough to keep straight stock straight.

Mike Radakovic, foreman, Laharco Industries, Minneapolis, Minn



Shock Tool Loosens 'Frozen' Nuts

The illustrated tool was constructed for jarring 'frozen' nuts loose, particularly those in inaccessible areas. A hammer provides the necessary force once the tool has been positioned.

The two main parts are made from tool steel so they may be hardened after machining. A housing to receive a spindle and spring is first machined, leaving its bottom sufficiently heavy to withstand hammer blows. A spring-retainer ring is made and fitted to the open end of the housing. Two holes are then drilled into the bottom to hold two dowel pins which will retain a bearing ball.

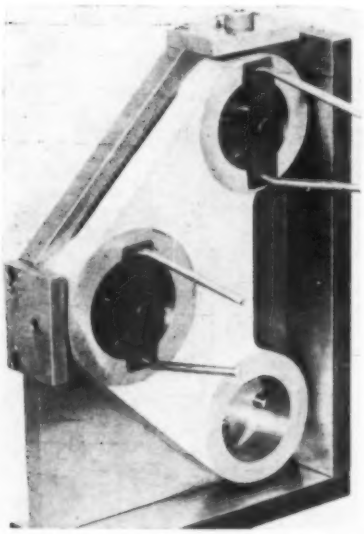
The spindle is turned to a sliding fit in the housing and reduced at one end to accommodate a compression spring. A square shank, milled on the smaller end, accepts standard box wrenches. The opposite or heavier end is milled to a 15° angle.

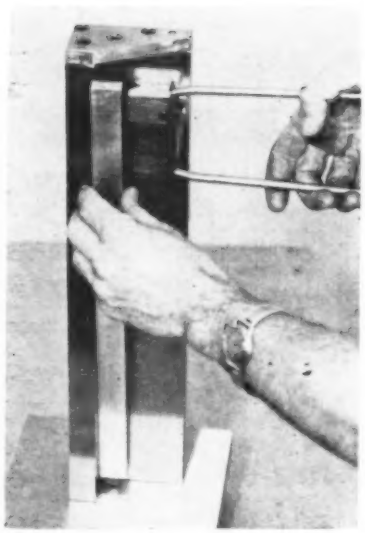
When spindle and housing have been hardened, the parts are assembled with the dowels ground for clearance, and a steel ball is dropped between them. The spring and retainer ring hold the spindle tightly on the ball.

A socket is mounted on the square shank and placed on the nut to be removed. The housing is then rotated counter-clockwise, anywhere between 90° to 170°, but not over the crest. When the end of the housing is struck the force is converted into a downward and twisting motion to loosen the nut.

H Koslow, Bronx, NY

Practical Ideas...





Handlebar Springs Speed Fixture Lockup

This is an idea for quick-acting jig and fixture clamps that work when there is sufficient space and when heavy pressure is not required. The springs are much quicker acting than split washers and bolts, and they deliver about 150 lb of thrust.

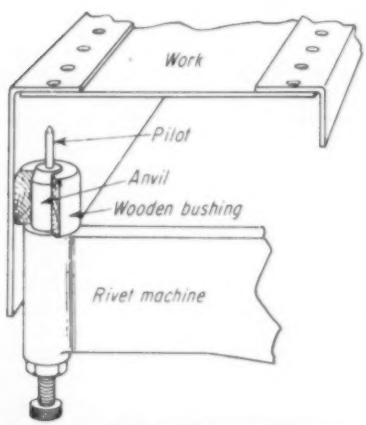
Each spring is roughly 0.062 in. thick, 1 in. wide, and 3½ in. long. Both ends are drilled and countersunk for ¼-in. rivets. The springs are bent, then heat-treated and drawn to about 45 R_c.

Handles are 5/16-in. cold-rolled steel turned down to ¼ in. for a 3/32-in. length at the end so they can be riveted through the holes in the spring. Handles are bent slightly to allow easier gripping.

The vertical jig for the long part has a solid spring, but the bored casting is held by three springs that are cut out in the middle so they will slip under the bolt heads. Bolts do not need to be moved at all, once the setup is made.

When the handles are squeezed, the springs flatten out so they can be inserted in the jigs.

Roger P Linder, Lake City, Minn



Bushing Guides Rivet Pilot

While riveting metal troughs, we had no trouble locating and aligning the first hole with the pilot pin. But from there on it took a lot of jogging to drop the rest of the holes on the pilot.

A good percentage of the difficulty was eliminated by installing a wooden bushing on the rivet-machine anvil. Having the proper outside diameter, the bushing held the pilot at a close center-to-inside wall distance. It was then necessary only to allow the bushing to bear on the inside wall of the trough as it was slid from one hole to the next.

The outside radius of the bushing was turned slightly smaller than the distance from the center of the holes to the inside wall. Forced onto the anvil, the bushing rests slightly below the top surface so the work won't crack the wood.

Fred Lettino, LI City, NY

CLINT McLAUGHLIN
Rockaway, NY

won $25 in addition to regular payment for his idea:

HAND-OPERATED COLLET CHUCK LOADS WHILE ROTATING

in the May 19, 1958 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

GRAND PRIZE OF $100.

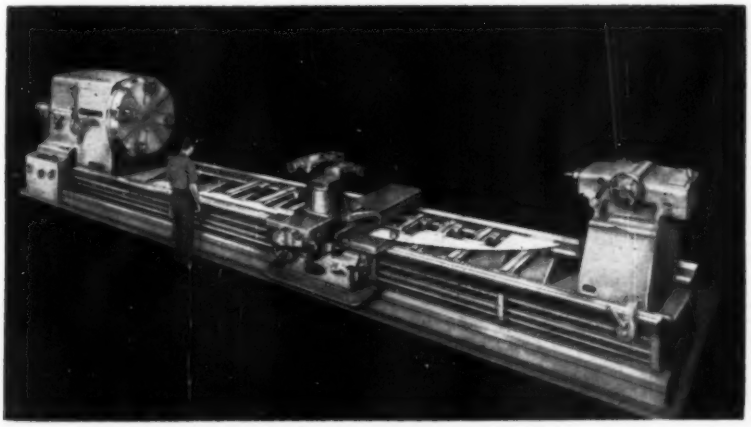
JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.

New Shop Equipment
Materials and Parts



Monarch Contouring Lathe Provides Extra-Large Swing Capacity

Designed for precision contour turning, boring and facing of missile nose cones, nozzles, motor cases, airframe sections, domes, and other large, thin-walled and fabricated parts, this large lathe, the Missile Master, meets the missile industry's requirements for extra-large swing capacity, tight tolerances and critical surface finishes.

Clearance diameter of the machine is 85 in., with 67-in. cross-slide swing. Bed lengths are available up to 300 in. between centers, in increments of 48 in. The lathe is equipped with the company's swiveling air-gage tracer contouring system.

The 25-hp drive motor supplied is more than adequate for the relatively light workpieces recommended. Eight speeds are available using the faceplate drive, 1¼ to 30 rpm. Driving power for the 16 speeds in the high speed range, 1¼ to 250 rpm, is applied directly through the spindle.

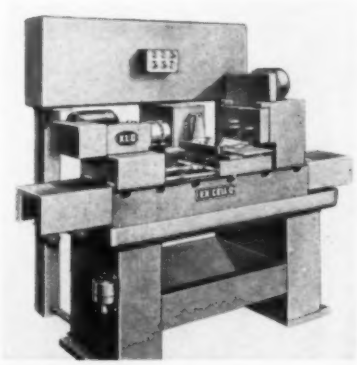
Gear box is totally enclosed and automatically lubricated. A range of 48 commonly used threads and feeds is provided. Threads range from 2 to 112 per inch; feeds from 0.00075 to 0.0421 ipr.

The lathe's bed design, 54 in. in width, features a solid top wall sloped toward the rear, simplifying chip removal and directing coolant flow toward the rear of the machine.

Available as an optional feature is a range of eight extra low speeds. These are for use in thread milling and range from 1/32 to ¾ rpm. Employing a circular feed of 6 ipm, this lathe is capable of milling threads on any missile component between 2½ and 67 in. in diameter.

Monarch Machine Tool Co, Sidney, Ohio

MORE DATA? Circle 51, inside back cover



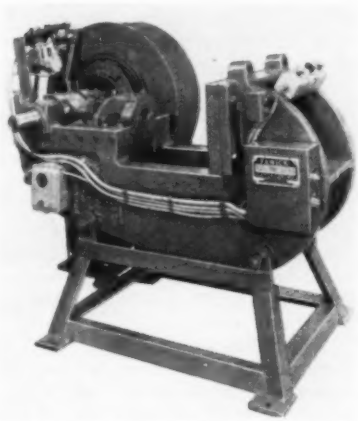
Machines Bore One or Several Holes in One Pass

Designed for single-pass boring of close center-distance holes, the Style 711 and 712 (illustrated) boring machines can be fitted with Ex-Cell-O spindles and custom-made multi boring plates to bore such holes with all the accuracy associated with conventional boring methods. The 712 machine illustrated is equipped with the multi-spindle head at one end and a standard single spindle unit at the other. The single spindle unit can be replaced by another multi-spindle unit if required.

The Style 711, when supplied with one single spindle unit only, meets production requirements for small hole boring on many simpler jobs. Features common to both machines include pneumatically operated table with hydraulic feed control, and a centralized hand-controlled lubrication system. A form of mist coolant can be supplied when necessary.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich

MORE DATA? Circle 52, inside back cover

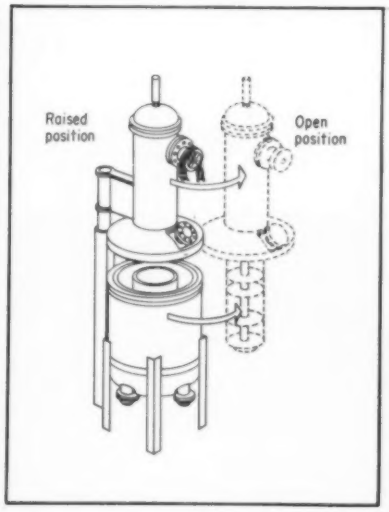


Horizontal Press Mounting Speeds Ejection of Lightweight Parts

This new horizontal mounting of the 30-ton Press-Rite OBI press is reported to simplify the ejection of lightweight pieces stamped at high speed. Fabricated steel base provides solid mounting. The motor mount is built onto the base and provided with a screw adjustment for belt tension. Operating controls are conveniently grouped at the front of the machine.

Sales Service Machine Tool Co, Press-Rite Div, 2563 University Ave, St Paul 14, Minn

MORE DATA? Circle 53, inside back cover



Hayes Vacuum Heat-Treating Furnace Can Handle New Exotic Metals

This electric heat treating furnace is a cold-wall, resistance-type unit with a heating chamber of heat-reflecting nickel-clad steel surrounded by a circular water jacket. Inside the chamber there is a set of reflective baffles; inside this, a new type heating element; and finally, in the center, is the charge.

The combination of 0.1-micron vacuum and 3000 F controlled temperature, the furnace is ideally suited for heat treating all metals, including such difficult, exotic metals as titanium, tantalum, tungsten, molybdenum, zirconium, hafnium and niobium. All of these materials have been successfully heat treated with reportedly excellent results and no discoloration.

High temperatures are possible because of the improved heating element. It is composed of shaped plates instead of coils, and is self-supporting. Power is evenly distributed over the entire plate area.

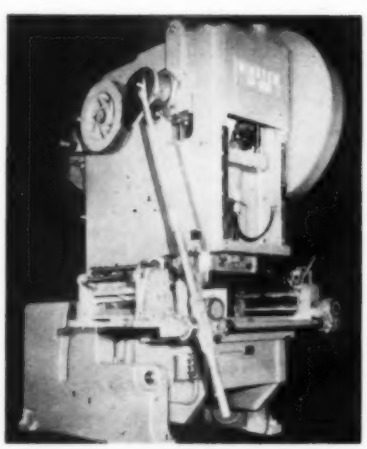
A highly efficient vacuum pumping system pulls a full vacuum (0.1 micron) in only 15 min. The furnace heats and cools rapidly. It comes from ambient to treatment temperature, up to 3000 F, in less than 30 min. After treatment the work is raised to the separate cooling chamber, where the heat is rapidly radiated to the water jacket. Cooling from 3000 to 700 F takes less than 30 min.

All metal-to-metal permanent junctures are welded, producing leakproof joints. The chamber cover and wall are machined for a close fit, and have an O-ring or a similar type seal. Leakage rate under this system is as low as 4 micron-liters per sec. Leakage will remain within the 15 micron rise per hr that is considered satisfactory for this type of furnace.

The cover is raised by a hydraulic lift during loading and unloading operations. A pulley system eases the raising and lowering of the charge.

C I Hayes, Inc, Cranston, RI

MORE DATA? Circle 54, inside back cover



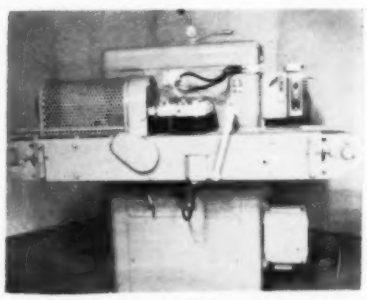
Minster Gap Press Line Has Automatic Feeds

Series G1 single point gap presses with feeds for automatic production are available in capacities from 75 through 250 tons in both fixed base and inclinable types. Either single or double roll feed equipment can be supplied.

Electrical, air, and recirculating lubrication controls are mounted within the legs. Combination air friction clutch and brake unit permits accurate controlled single or multiple cycling.

Minster Machine Co, Minster, Ohio

MORE DATA? Circle 55, inside back cover



MODEL 420-C WINK CUTTER is a high-speed precision machine designed for cutting rubber, plastic, textile fiber, and other hot or cold extruded materials at extremely high speeds—*Motch & Merryweather Machinery Co, Wink Cutter Div, 1250 E 222nd St, Cleveland 17, Ohio*

MORE DATA? Circle 56, inside back cover

Tape Control System Controls Any Conventional Machine Tool

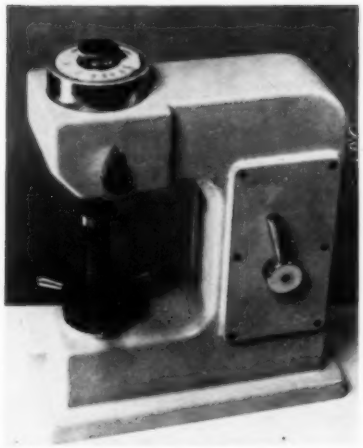
The "F" Series Duplimatic, Factrol Analog system is a continuous path magnetic tape system for controlling motions and auxiliary functions of machine tools. System is a completely standardized unit using identical packages for all machine tools and processes requiring motion control. More or fewer packages are used depending on the number of axes, motions, or auxiliary functions to be controlled.

Feedback is obtained by scanning meter bars mounted parallel to each axis. Also included is a strobe viewer and control knobs that give a visual electronic adjustment of ±0.010 in. to each tool slide. The scanner and meter bar combined with the strobe viewer provide accurate measuring for gaging the position of the slides whether the machine is operated under conventional or tape control.

Also available is a mechanical analog recorder for transferring the tool path from a part drawing onto magnetic tape. Bulletin available.

Tracer Control Co, Hazel Park, Mich

MORE DATA? Circle 57, inside back cover



Micro-Hardness Tester Gives Readings Without Microscope

Low-cost tester that utilizes a virtually frictionless hydraulic method loads a diamond indenter which supplies a direct reading corresponding to Vickers diamond pyramid hardness numbers. Testing takes only 15 seconds, and is reported to be suited for hardness testing of watch and instrument parts, surface layers, thin materials, small wires, tips of cutting tools, wire punches and other small parts.

Instrument has a hardness range of 100 to 1000 (Vickers), and is available with 1-kg or 2-kg loads, penetrating as little as 0.002 mm or 0.004 mm respectively. Price, with extra anvils and carrying case, is less than $600.

Newage Industries, Inc, 222 York Rd, Jenkintown, Penna

MORE DATA? Circle 58, inside back cover

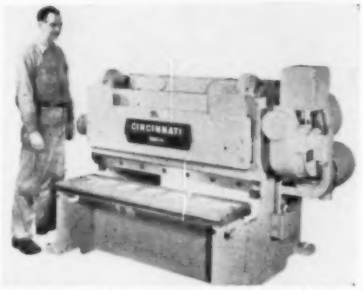
1500-F Infrared Modules Provide Uniform Heating

Line of infrared heating modules with housings that can be quickly stacked into any layout to meet variable requirements uses elements of formed resistance wire instead of bulbs or tubes. In addition to giving immediate, even heat they are said to emit color blind radiation that heats all colors and surfaces of material equally well.

Heating module is made up of a sheet metal shell, a formed resistance wire heating element, a ceramic diffusion face, and alternate layers of high-temp batt and reflective insulation. Similar module is supplied which has a stainless steel reflector face instead of the heating element and facing material. This unit increases heat efficiency by reflecting stray rays back to the work, and forms a part of the oven structure where heating modules are not needed. Size of the module is 2 ft x 1 ft x 6 in. Heating modules have three power outputs: 3, 2, and 1 kw. Temperature is up to 1500 F at the module face.

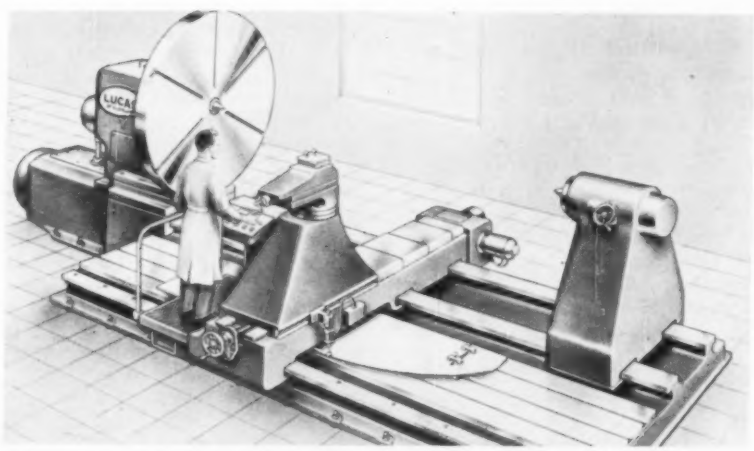
Infrared Systems, PO Box 1, Pompton Lakes, NJ

MORE DATA? Circle 59, inside back cover



SHEAR is designed to shear electrolytic copper as part of an automatic cutoff line. Machine is 4 ft 3 in. between housings and has a 6-in. gap. It has electric clutch control and operates at 65 spm. Machined openings in table permit installation of stock feeding equipment. Model illustrated is a special 1004-RA—*Cincinnati Shaper Co, PO Box 111, Cincinnati 11, Ohio*

MORE DATA? Circle 60, inside back cover



Lucas Large-Swing Lathe Controlled By Punched or Magnetic Tape

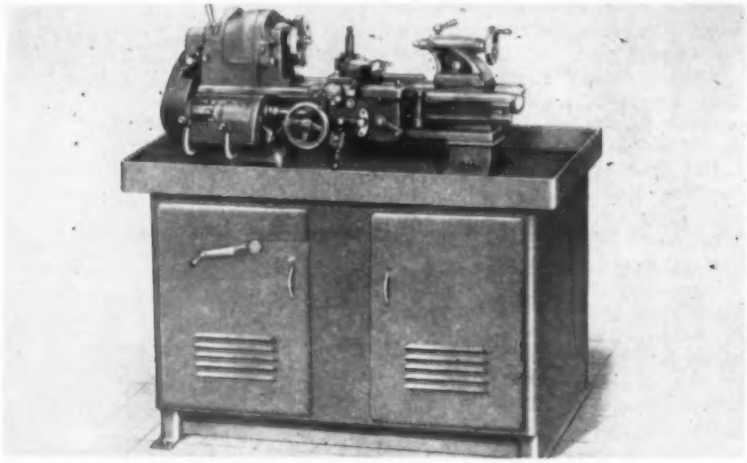
Designed for turning operations on cylindrical, conical, or developed shapes on lightweight pieces of great length and diameter, machine is available in semi-automatic and tape-controlled fully automatic models. As a semi-automatic, it incorporates a one- or two-dimension electronic tracer control for cross-slide and carriage. In fully automatic models, cross-slide and carriage are controlled by punched tape numerical positioning or magnetic tape-contouring control. Three hardened and ground ways support the carriage. On tracer-controlled models flat templets are mounted on a T-slotted plate between the outer and intermediate ways.

All functions are electrically operated. Infinitely variable speeds and feeds are controlled from a console mounted on an operator's platform attached to lathe carriage. On varying diameters, constant cutting speeds are maintained automatically. Constant cutting feed is maintained by a selsyn feedback system with which, in combination with pickoff gears, it is possible to cut a wide range of threads.

Models are available with up to 96-in. swing over bedways and up to 192-in. length. Motor-generator set is included as standard equipment with this lathe.

Lucas Machine Division, New Britain Machine Co, 12302 Kirby Ave, Cleveland 8, Ohio

MORE DATA? Circle 61, inside back cover



South Bend 10-in. Lathes Feature Increased Thread Cutting Range

An improved line of 10-in.-swing lathes incorporates many new design features in the gear box, carriage, bed and tailstock. Both bench and floor models are made in several bed lengths and are supplied with either engine lathe or toolroom lathe equipment.

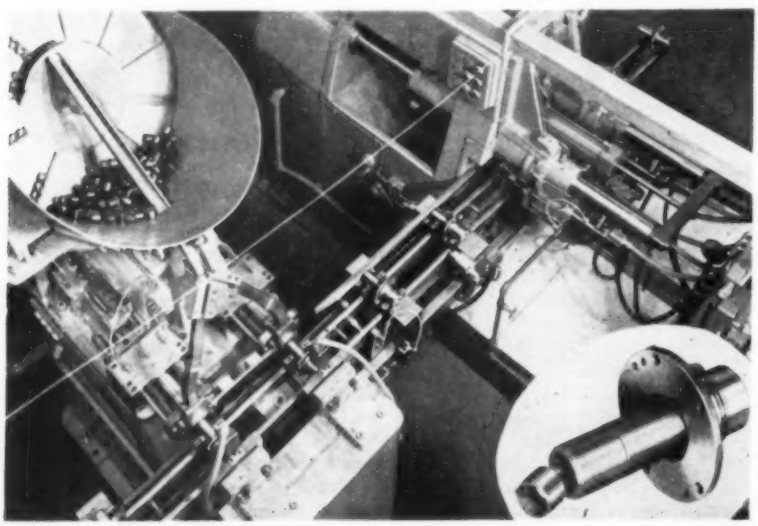
Thread cutting range has been increased to 70 pitches, 4 to 480 per inch including all standard pitches 4 to 80. Also included are 11½ and 27 pipe thread, 4, 6 and 7½ fire hose coupling thread, 30 instrument thread and fine pitches up to 480 per inch for watch and instrument work.

Gear box provides instant selection of 70 power longitudinal turning feeds and 70 power cross feeds. Headstock can be supplied with threaded, long taper, or cam lock spindle nose.

Capacity through spindle is 1⅜ in. with 1 1/16-in.-max collet capacity. When equipped with a two-speed motor the lathe has 24 spindle speeds ranging from 27 to 1400 rpm.

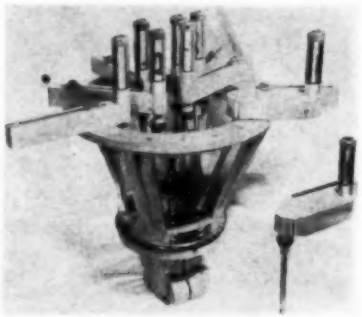
South Bend Lathe Works, South Bend 22, Ind

MORE DATA? Circle 62, inside back cover



ASSEMBLY AND BORING MACHINE combines a bushing press fit assembly operation with precision boring. The stator supports (insert) are produced at rate of 400 per hr. Tolerances of ±0.0005 in. on boring diameter and 0.002 in. TIR on concentricity and squareness are maintained. Machine is designed for future integration into a transfer line and may be controlled manually or cycled automatically—*F Jos Lamb Co, 5663 E Nine Mile Rd, Detroit 34, Mich*

MORE DATA? Circle 63, inside back cover



Extension Bracket Assembly Broadens Drilling Range

Extension spindle bracket assembly has been designed for use with the full line of Thriftmaster universal joint drillheads.

Unit provides a 4⅛-in. extension of the maximum adjustment and permits drilling under and beyond the flange of the drillhead body. Operation is at same maximum speed and capacity as the standard spindle bracket assemblies.

Thriftmaster Products Corp, 1016A North Plum St, Lancaster, Penna

MORE DATA? Circle 64, inside back cover

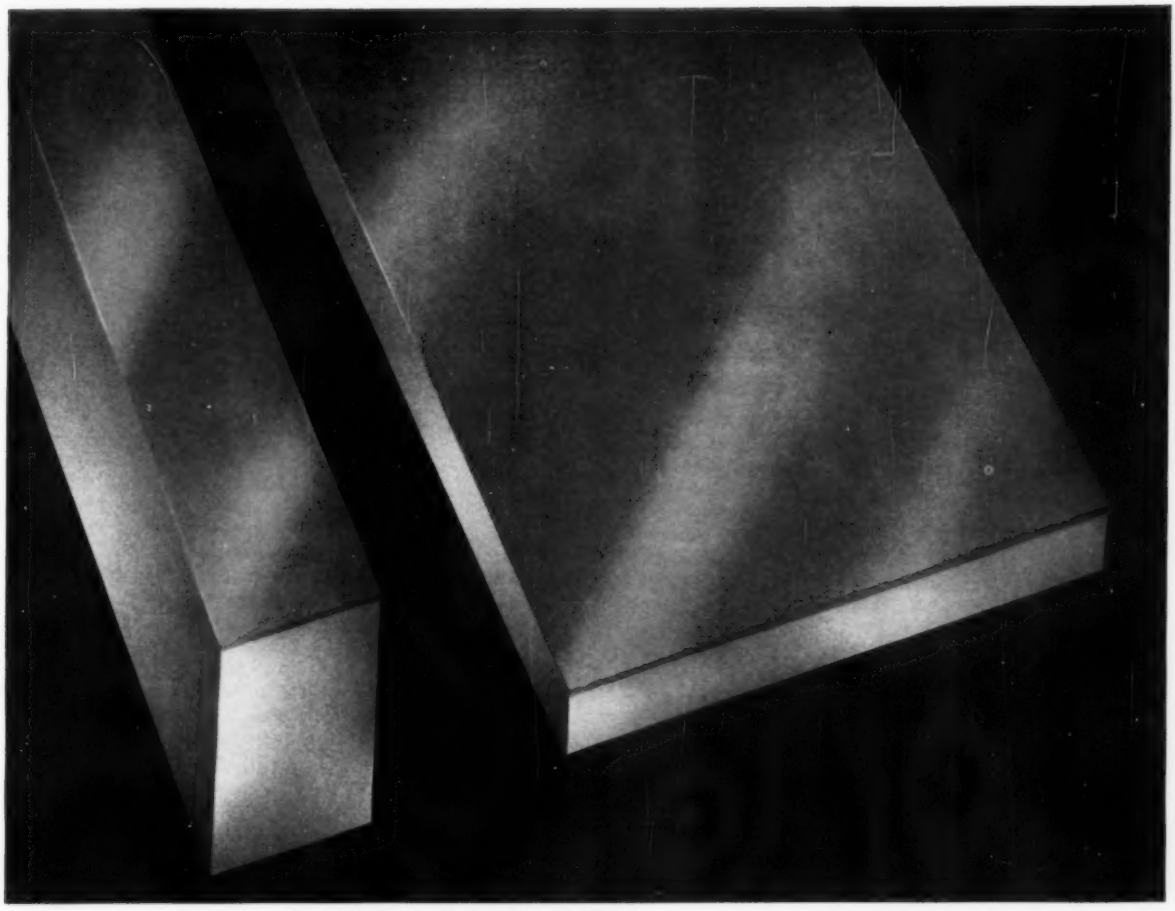
Portable Computer Evaluates Metal Cutting Conditions

The Kennametal Cutmeter puts into convenient form the relationships of feed, speed, depth of cut, power, etc, that have been established through metal cutting research. It can be used to evaluate metal cutting conditions or for establishing machining practices on new operations.

Practical speeds and feeds for starting a job are quickly obtained by direct setting of the dials. For more detailed recommendations, charts are provided for adjusting to unusual tool geometry or wear limits.

Kennametal Inc, Latrobe, Penna

MORE DATA? Circle 65, inside back cover



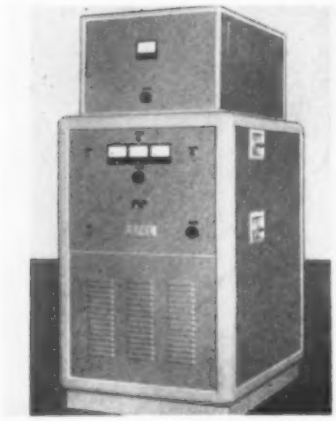
New Lamina Wear Plates Last Longer, Cost Less!

Now . . . save money and get better performance wherever you have sliding contact between flat metal parts! The principle of bronze electroplated on a steel backing originated with Lamina Bronze-Plated Guide Pin Bushings. Proven during countless millions of punch press hits, it is now being used successfully to produce flat wear plates.

This new concept in wear plate design combines the low cost, ready machinability and solid backing of steel with the long-wearing, non-seizing, free-running properties of a copper-tin bronze alloy. Lamina Bronze-Plated Wear Plates are flat, parallel, and can be easily machined to suit your application. Standard sizes available from stock. End costly wear problems and reduce expensive downtime now! Write for complete information.

Lamina
DIES AND TOOLS, INC.
P.O. BOX 31, ROYAL OAK, MICHIGAN

MANUFACTURERS OF LAMINA GUIDE PINS, BRONZE-PLATED BUSHINGS AND THE FINEST PRECISION PROGRESSIVE AND LAMINATION DIES.



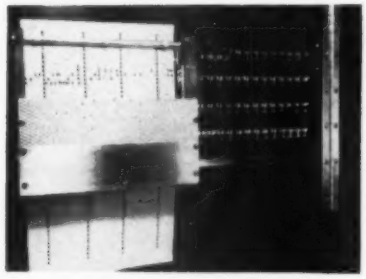
Inaucrion Heating Generator Offered in Dual Frequency Model

Unit is rated at 10 kw of output power. Lower frequency range is 250 to 600 kc; higher range is approx 2 to 5 mc.

The megacycle tank circuit components are located in the lower portion of the cabinet and the standard frequency tank circuit components in the smaller cabinet on the top. Both circuits use the same oscillator tube and dc power supply. Each tank circuit has a separate grid control, permitting proper adjustment for grid drive requirements. For experimental work the megacycle frequency range can be altered by using capacitors of different values.

Lepel High Frequency Laboratories, Inc, Woodside, NY

MORE DATA? Circle 76, inside back cover



Tape or Card Reader Controls Large Number of Circuits

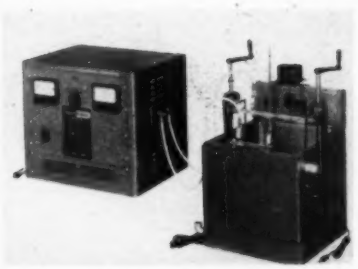
This tape or card reader will control an unusually large number of isolated circuits. Because of this feature, the equipment can simplify voltage programming circuits which might otherwise require relays for circuit isolation.

Unit accepts tapes from 3 to 18 in. wide, with ten circuits (or punched holes) to the inch. Device consists of three basic sections: a tape advance solenoid and pawl mechanism or drive motor and sprocket; a precious-metal contact strip; and a row of plated music wire hole-detecting feelers on a hinged mounting strip. These elements can be supplied in almost any size.

Among the applications are machine tool program control, batch process control, automatic testing and checkout systems, voltage programming and code conversion.

Program Control Associates, Box 217, Cathedral Station, New York 25, NY

MORE DATA? Circle 77, inside back cover



Chrome Plating Unit Is Designed For Plant Maintenance Work

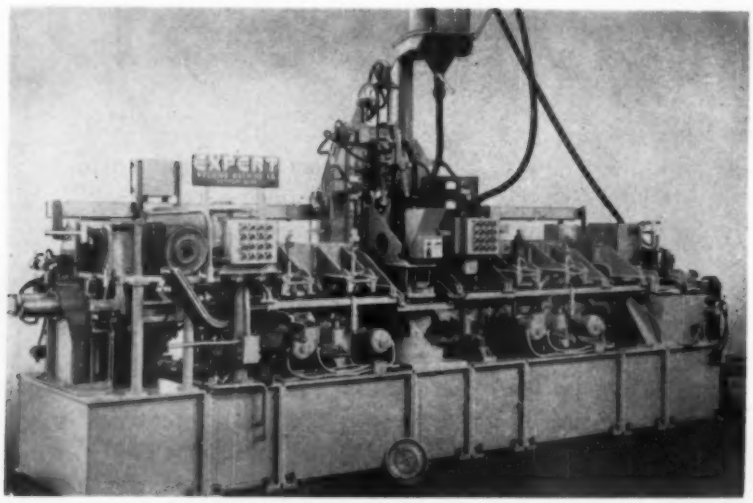
Model A, No. 75 Chromplater, is a package unit designed for plant maintenance. Among its many uses are prolonging cutting tool life, salvaging worn parts, plating friction parts against wear, and protecting against corrosion and rust.

Unit will deposit from 0.0001 to 0.010 in. of chrome on taps, dies, drills, reamers, form tools, shafts, gears, and on all types of worn steel, cast iron or nonferrous metals.

Complete package contains a 75-amp rectifier, plating tank, work platform, exhaust hood, electric blower, two gallons of concentrated plating solution, a thermometer and a hydrometer. Price is $975.

Dawson Corp, 302 Fifth Ave, Pelham, NY

MORE DATA? Circle 79, inside back cover



DISK AND HUB ASSEMBLIES for transmissions are assembled preheated, welded and heat treated in one continuous operation on this automated, 10-station, inline transfer welding machine. Production rate is 120 assemblies per hr. Modular construction permits station addition, removal or interchange—*Expert Welding Machine Div, Expert Die & Tool Co, 17144 Mt Elliott Ave, Detroit 12, Mich*

MORE DATA? Circle 78, inside back cover

Semi-Automatic Air-Cooled Gun Speeds CO_2 Mig Process

Air-cooled gun for use with Hobart's Migarc process (metal-inert-gas shielded arc welding using carbon dioxide as arc shield) is lightweight, easy to use, and eliminates need for water hoses and connections. It is reported that on mild steel auto frame subassemblies production welding speeds greater than 200 ipm have been obtained on ideally positioned fillet welds.

Gun, control, and wire-feed unit are portable or can be separated into components for mounting for single station operation.

Hobart Brothers Co, Hobart Square, Troy, Ohio

MORE DATA? Circle 80, inside back cover

for every wheel that turns in industry

Lubricating oils, cutting oils, multi-purpose greases, greases for spraying . . . whatever your needs, Atlantic has the lubricant to help you. Atlantic lubricants insure maximum lubricating performance at low cost for every job in the plant . . . for every wheel that turns in industry.

For lubricating products that fit your specific needs, or for expert assistance with your lubricating problems, write or wire any of these Atlantic offices.

Philadelphia
260 South Broad Street

Providence, R. I.
430 Hospital Trust Building

Reading, Pa.
First and Penn Aves.

Charlotte, N. C.
1112 South Boulevard

Pittsburgh, Pa.
Chamber of Commerce Building

Syracuse, N. Y.
Salina and Genesee Sts.

Atlantic Refining Co. of Brazil Rio de Janeiro, Brazil

ATLANTIC

LUBRICANTS · WAXES
PROCESS PRODUCTS

CIRCLE 248 READER SERVICE CARD

Brinell Hardness Tester Inspects Interior Walls of Cylinders

Portable model for testing interior walls of cylinders or cylindrical openings within engine blocks and castings uses a 5 or 10-mm carbide ball with loads ranging from 500 to 1500 kg. Accurate Brinell readings are guaranteed for these hard-to-reach spots.

Instrument can be furnished for openings with minimum diameter of 6 in. and can take tests at a depth of 10 in. or more. Extensions can be furnished for large size pipe to hold test head in position.

King Tester Corp., 440 N 13th St., Philadelphia 23, Penna

MORE DATA? Circle 81, inside back cover

Milling Cutter Body Protected by Wedges

Hardened-steel locking wedges placed behind the carbide inserts protect the cutter body in Wesson's new line of throwaway insert milling cutters. Wedge anvil rides up and down on a differential screw and inserts can be loosened for indexing or changing with less than ½ turn of the screw. Since wedge projects beyond the cutter, max support is provided for the insert.

Standard, square solid carbide inserts give eight cutting edges and, because the insert locates against a precision pin, no gaging is required in indexing or changing. Total run-out of insert seats does not exceed ±0.0003 in. Cutters have 7° negative radial and axial rake angles. Complete line is available in 15, 30, 45, and 87° lead angles.

Wesson Co, 1220 Woodward Heights Blvd, Detroit 20, Mich

MORE DATA? Circle 82, inside back cover

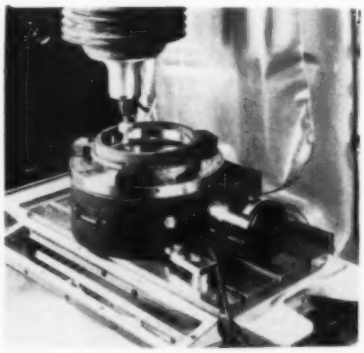
Portable Vibration Analyzer Performs Triple Function

Model 311 serves as vibration analyzer, portable in-place balancer, and system to monitor vibration in machinery. Instrument incorporates a meter that presents the peak-to-peak displacement in three ranges of 10 mils, 1 mil, and 0.1 mil. Variable frequency filter is provided to permit a separate analysis of each frequency from 500 to 5000 cpm.

Other components include a velocity vibration pickup and a stroboscopic lamp to present the relative phase of imbalance and to permit visual study of rotating parts. Unit is furnished in a portable case.

International Research & Development Corp, Box 55, Worthington, Ohio

MORE DATA? Circle 83, inside back cover



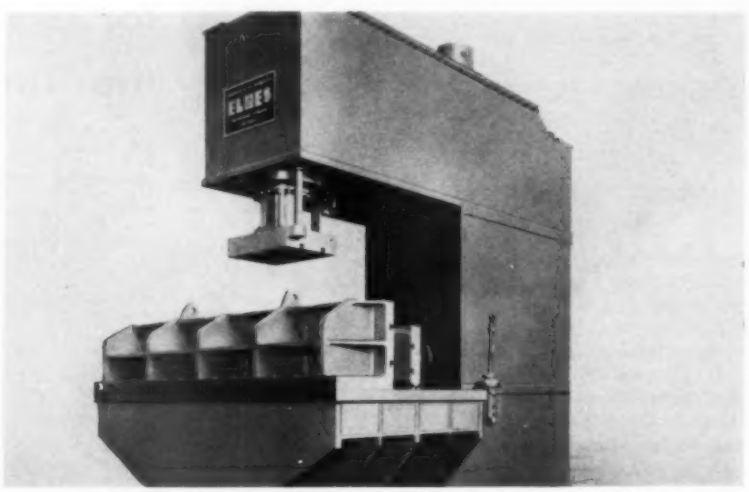
Rotary Grinding Fixture Fits Surface Grinders, Jig Grinders

The Roto-Grind is a precision grinding fixture that is reported to double the capacity of a toolroom grinder. Suited for external and internal grinding, this unit is essentially a motorized table that turns under the grinding wheel.

Fixture weighs 54 lb, is 10⅜ in. in diameter and is 5¾ in. high. The top plate is hardened steel.

M-M Tool Mfg Co, Roto-Grind Dept, 1124 E Third St, Dayton 2, Ohio

MORE DATA? Circle 84, inside back cover



SPECIAL HYDRAULIC PRESS combines the functions of both a C-frame press and a horizontal bulldozer. Downward-acting vertical ram has a capacity of 300 tons; platen size of 30 in. left-to-right by 24 in. front-to-back; stroke of 30 in.; and an opening of 54 in. Horizontal ram has a capacity of 150 tons; platen size of 30 in. left-to-right by 24 in. high; stroke of 24 in.; and an opening of 72½ in.—*American Steel Foundries, Elmes Engineering Div, 1150-A Tennessee Ave, Cincinnati 29, Ohio* MORE DATA? Circle 85, inside back cover

Sensational Blitzhacker gets its edge from

SHARON STAINLESS

Here's something new in food choppers. It cuts its way through more food faster than you can pronounce its name—*Blitzhacker.*

One of the more amazing things about the Blitzhacker is its blade, an accordion of Sharon Stainless Steel with a cutting edge *shaved* on. A special shaving process develops a durable edge that will stay sharp years on end without chipping.

When you have a problem or an idea where Stainless Steel could be involved, call the Sharon office nearest you for service.

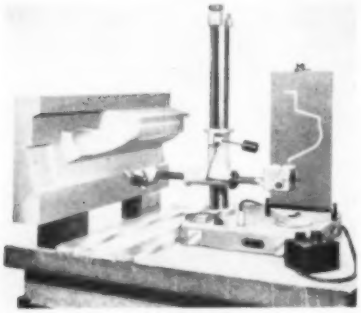
SHARONSTEEL

SHARON STEEL CORP.

SHARON, PENNSYLVANIA

CHICAGO • CINCINNATI • CLEVELAND • DAYTON • DETROIT • GRAND RAPIDS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE
NEW YORK • PHILADELPHIA • ROCHESTER • SHARON • SEATTLE • SAN FRANCISCO • WASHINGTON, D. C. • TORONTO • MONTREAL

CIRCLE 249 READER SERVICE CARD



Device Simplifies Inspection Of Contoured Parts

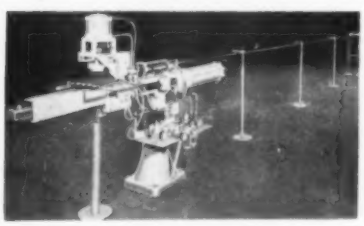
OGP Contour Transcriber, Model 8-18, is designed for non-destructive inspection of contoured parts. Unit makes a permanent record on specially coated glass of contours of master patterns, models, dies, molds, and similar parts.

Complete and continuous reproduction, called a trace, can be made of both exterior and interior part contours, top and bottom halves of a die, and mating parts. Traces are measured by determining X-Y coordinates on conventional contour projectors, by comparing with a grid, and by comparing to a master outline or reticle. Device, designed for semi-automatic operation, handles contours up to 8 in. deep by 18 in. long. Traces on glass may be retained as a permanent record or glass may be recoated and used again.

OGP Contour Trace Measuring Viewer, companion accessory, facilitates measurement and evaluation of traces. It is provided with a precision grid glass illuminated from below by a special cold neon tube. Scale readings to 0.0001 in. are possible, using the grid and its measuring micrometer.

Optical Gaging Products, Inc, 26 Forbes St, Rochester 11, NY

MORE DATA? Circle 86, inside back cover



Serpentine Bender Handles Tubing Up to 40 ft Long

Bend-Ex Model S produces bends on 0.017-in. wall copper and aluminum tubing up to 40 ft long, ¼ to ⅝ in. dia on minimum centerline radii. Unit bends up to 180° at speeds up to 900 bends per hour.

Model is equipped with fully automatic head, feed, and table return, and a quick-change angle selector. It is completely air-operated.

Paul Machine Tool Division, Paul Machine Tool & Die Works, 4600 S Kedzie Ave, Chicago 32, Ill

MORE DATA? Circle 87, inside back cover

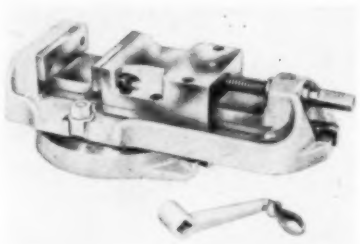
Hot Hardness Tester Tests Metals at Elevated Temperatures

Model 6-JR Hot Hardness Tester, utilizing a Rockwell tester in conjunction with a small electric furnace, measures the hardness of metals contained within the shell of the controlled atmosphere furnace at temperatures exceeding 1500 F. Such tests will provide data on structural phenomena as metals change in character when heated and subsequently drop to normal room temperature.

Instrument should prove important in testing metals for use in jet engines, rockets and missiles. The test specimen is heated to a predetermined temperature in the furnace. The tester's diamond Brale penetrator, for making indentations in the specimen's surface, is contained within the furnace and is heated along with the specimen. The Rockwell hardness is indicated on an eye-level dial gage.

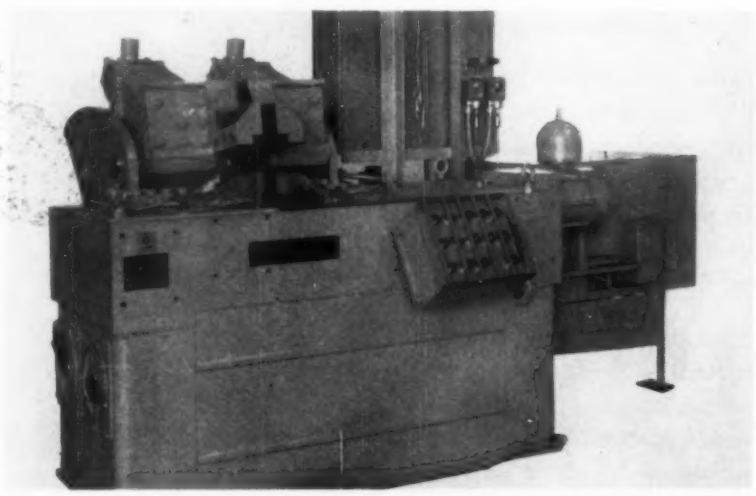
Wilson Mechanical Instrument Div, American Chain & Cable Co, Inc, 929 Connecticut Ave, Bridgeport 2, Conn

MORE DATA? Circle 88, inside back cover



TROUGH VISES are available in five sizes, 4, 5, 6 7, and 8 in., with the opening capacity of each vise equal to the jaw width. Deep coolant troughs return all coolant to the machine table. Swivel bases, which are optional, permit setting at any angle in the horizontal plane—*Skinner Chuck Co. Dept V1, 200 Edgewood Ave, New Britain, Conn*

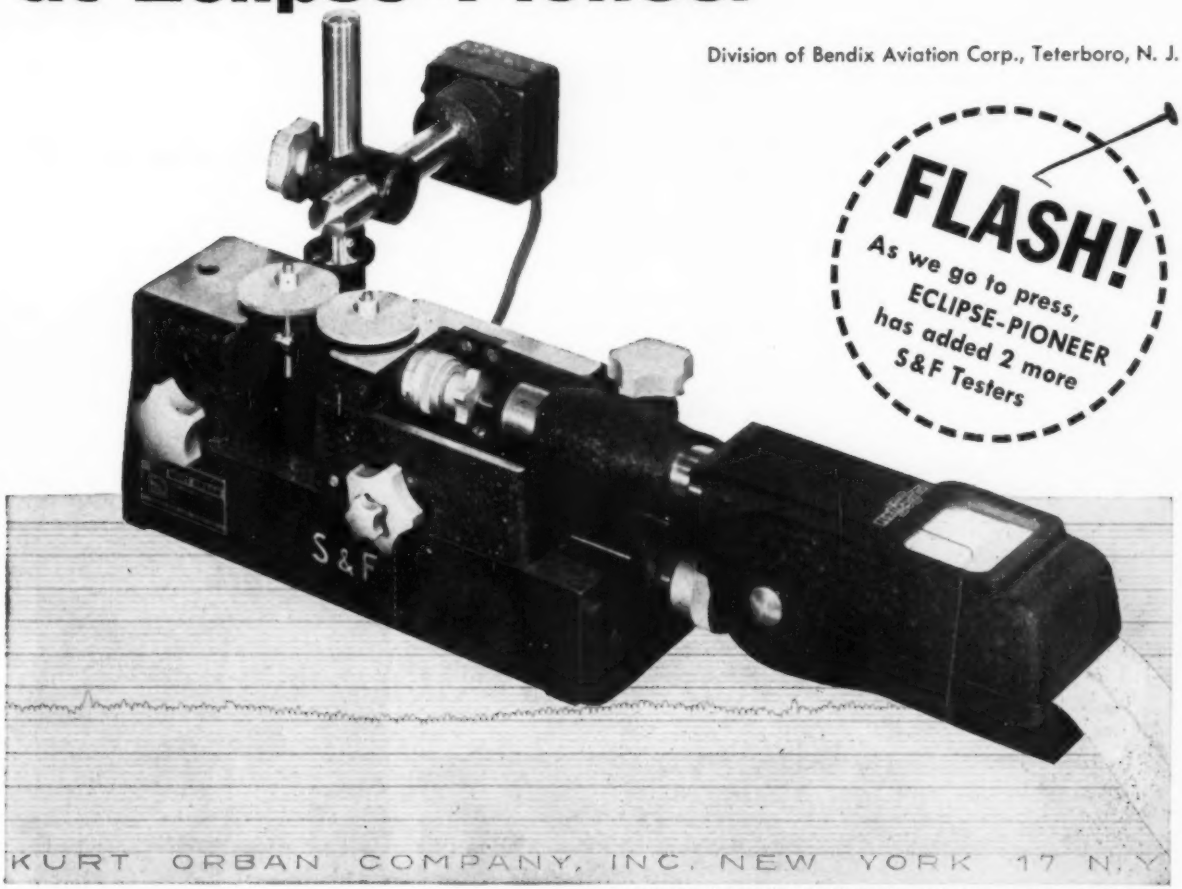
MORE DATA? Circle 89, inside back cover



AUTOMATIC FLASH WELDER Model F5, is one in a new line of automatic flash welders. This 400-kva unit is designed for flash welding hot rolled steel rings ⅜ in. thick and up to 8 in. wide. It can also handle flat stock. Upset force of nearly 38,000 lb is derived from a double-acting hydraulic cylinder—*Federal Machine & Welder Co, Warren, Ohio* MORE DATA? Circle 90, inside back cover

now it's 13 S&F gear testers at Eclipse-Pioneer

Division of Bendix Aviation Corp., Teterboro, N. J.



FLASH! As we go to press, ECLIPSE-PIONEER has added 2 more S&F Testers

Graphotest record of gear checking at Eclipse-Pioneer illustrates sensitivity of S & F Testers.

because there's no gear tester as accurate as the S & F

Gear specifications for Eclipse-Pioneer's directional gyros call for Precision Class 3 tolerances—tooth-to-tooth error of .0002", total composite error of .0003".

Eclipse-Pioneer found that the S & F provided the *extra* measure of sensitivity which assured that their gear production *really* held to these tolerances. It did the job faster, too. Set-up and change-over time was only a fraction of what it had been with other instruments.

That's why Eclipse-Pioneer recently added three new S & F testers—now has a total of 13 in active operation.

And that's why scores of other plants are changing over to the S & F—to make sure that the gears they make—or buy—are as accurate as they're supposed to be.

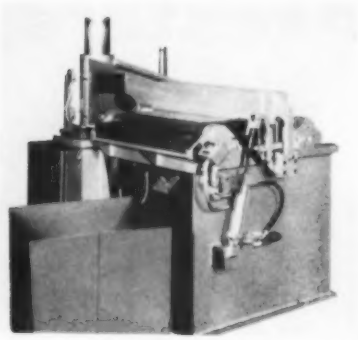
Ask us to show you why the S & F—*guaranteed to repeat within .00001"*—is revolutionizing gear checking. Or talk to the S & F user near you; we'll send you his name.

KO CO., INC. PRECISION MACHINERY

KURT ORBAN COMPANY, INC.

36 Exchange Place, Jersey City 2, New Jersey

CIRCLE 250 READER SERVICE CARD 111



Air-Operated Tangent Benders Are Designed for Light-Duty Work

This Light Series of tangent bending machines is designed specifically for bending on product sizes that do not require the heavier hydraulic machines.

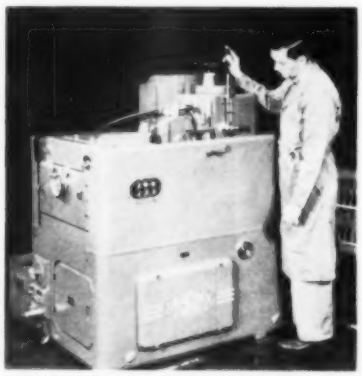
The duplex machine (illustrated) has adjustable double wings capable of handling a wide range of items from 11 in. upward. The distance between bends is 11 to 36 in., or can be made to meet special requirements. With this machine, two radius bends are made per cycle, and tooling can be combined to form a crown in this operation.

Standard models of the duplex type are furnished in sizes 24, 36 and 48 in. front to back, with radius bends, depending upon metal thickness, up to 2 in. Operating speeds are from 480 to 600 cycles per hr.

Other machines in this line include the conventional single-wing, the open-side single-wing, and the quadruplex bending machines.

Taylor-Winfield Corp, Warren, Ohio

MORE DATA? Circle 91, inside back cover



British Machine Grinds Gears Of 200 Diametral Pitch

The British-made Matrix No. 61 fine pitch gear grinder grinds from the solid by the exclusive Crushtrue process. The grinding wheel, similar to a large-diameter hob, or worm, has the basic rack form incorporated into its periphery.

Specifications on the gears include: maximum pitch of 16 DP, minimum of 200 DP; diameter of work, 6 in. max; max length between centers, 9 in.; max length of teeth, 3 in.

The machine grinds spur gears. Ratchets, involute splines, serrations and other generated forms are possible. Machine is of the full generating, continuous indexing type, giving the fastest possible production.

Distributed by Sheffield Corp, Dayton 1, Ohio

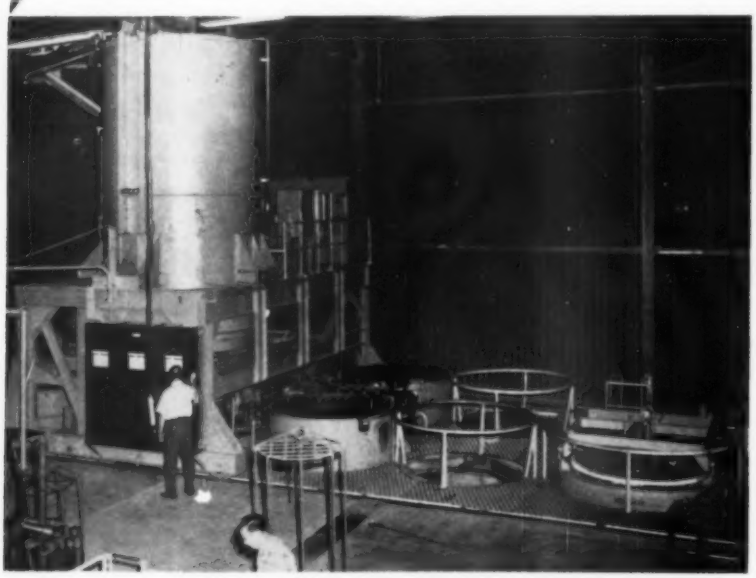
MORE DATA? Circle 92, inside back cover

Process Produces Bright Finish On High Alloy Steels

Cor-A-Brite metal finishing process utilizes one chip mass in one standard barrel finishing machine to produce a bright, lustrous finish on high alloy steels. Tests indicate that the quality of results is directly related to quality of the steel. Process gives a better surface on hardened steels than on unhardened steels of the same alloy.

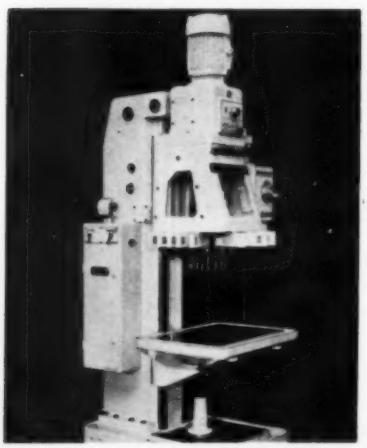
Roto-Finish Co, Kalamazoo, Mich

MORE DATA? Circle 94, inside back cover



LANDING GEAR COMPONENTS for aircraft and missiles are hardened in this gantry-type controlled-atmosphere hardening furnace. The furnace unit is raised on a frame structure that moves on rails to span over either a preloading station or adjacent oil and salt quench tanks. Capacity is 10,000 lb—*Lindberg Engineering Co, Heat Treating Div, 2450 W Hubbard St, Chicago 12, Ill*

MORE DATA? Circle 93, inside back cover



Drilling and Tapping Machine Carries Up to 12 Spindles

German-built machine has a unit-system spindle carrier making it possible to combine a number of spindle units in any position around an indexing table for semi-automatic drilling and tapping. Machine has a self-contained hydraulic unit that operates the vertical feed.

Standard feed, second feed, dwell period, jump power traverse, step control for deep-hole drilling, and rapid return are available. Unit can also be equipped with a separate tapping slide to permit threading of various pitch threads within machine's range.

Distributed by Eric R Bachmann Co, 27-11 41st Ave., Long Island City 1, NY

MORE DATA? Circle 95, inside back cover

CIRCLE 251 READER SERVICE CARD →

Precision TODAY to Gage TOMORROW'S Horizons

Current missile, atomic energy, and other similar projects are demanding gaging instruments capable of measuring with a precision thought impossible only yesterday . . . and of performing inspection jobs of extreme complexity. If *you* are engaged in missile or atomic development projects — or are planning to participate — you can count on Pratt & Whitney to design, develop and produce the special instruments you need.

We offer you a full staff of engineers and technicians, who have AEC and military clearance and work in classified areas. We also offer our proved ability as precision gage makers. We can develop gages to check components of any size or shape, and we can create gages fully integrated with business machines or other recording and analyzing devices. We are specialists in checking polar coordinates of contoured parts and in gaging miniature bearings and similar hard-to-inspect components.

Write, phone or call, and discuss your requirements with us. We're ready to start work now on gaging instruments for your projects. Pratt & Whitney Company, Inc., 11 Charter Oak Blvd., West Hartford, Conn.

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

Torit Announces Improved Line Of Dust Collectors

The company's line of cyclone separator dust collectors has been converted to radial fans. The fan change will give increased performance on all models because the radial wheels move greater volumes of air and operate efficiently against higher resistances (static pressure).

There is no increase in horsepower requirements and no price increases for the newly modified cyclone models. Model 13, ¾ hp, moves from 311 to 540 cfm; Model 18, 1½ hp, 456 to 825 cfm; Model 19, 2 hp, 860 to 1200 cfm; Model 219, 5 hp, 1598 to 2125 cfm.

Torit Mfg Co, 287 Walnut St, St Paul, Minn

MORE DATA? Circle 97, inside back cover

JackStacker Trucks Offered In Rider Model Line

Rider-design, high-lift JackStacker materials handling trucks are operated from a complete set of controls on the platform. New electrically powered line is an adaptation of the L-S walkie-type units.

Available in capacities from 1500-3000 lbs, with either forks or platforms, standard units have over-all lengths of 81, 87, 93, 99, or 105 in. The 81-in. model will maneuver in aisles only 7¼ ft wide. On models with telescopic masts, platform or fork elevations range from 101 to 129 in., depending on collapsed height.

Lewis-Shepard Products, Inc, 125 Walnut St, Watertown 72, Mass

MORE DATA? Circle 98, inside back cover

Internal Sawing Simplified By Detachable Band Saw

Band saw can be taken apart, inserted into an opening in the workpiece, and be securely joined in a matter of seconds. Dovetail notches interlock to take the longitudinal tension. The holes where the ends join have internal V-grooves which are used to join the blade. The ends are locked in place by inserting soft metal balls into the holes and flattening them to the band thickness, causing the balls to expand and fill the V-grooves.

There is no need to cut, weld and grind the blade. All teeth and the entire band retain the original hardness and temper—there is no softening or embrittlement as in welding. Soft metal balls sufficient for 25 splices are supplied with each band.

Davies Product Engineering Co, Box 216, Fraser, Mich

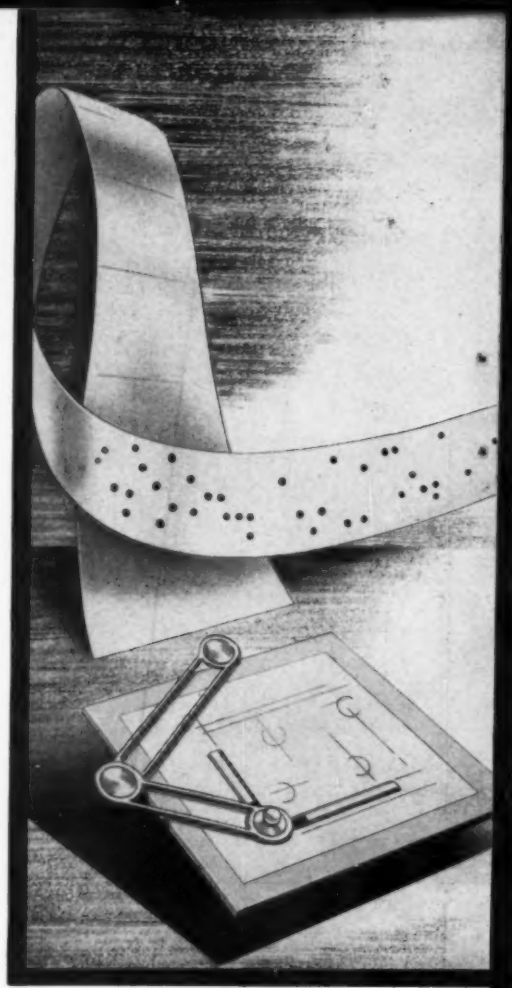
MORE DATA? Circle 99, inside back cover

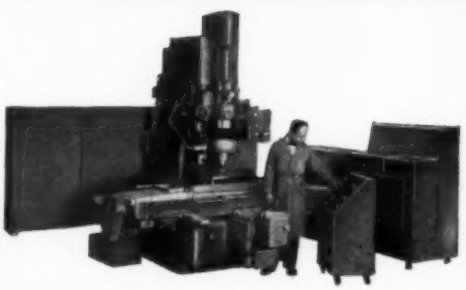
Automatic Unit Loads and Feeds Stock Lengths of Tubing

This automatic loader and feeder eliminates manual handling of stock lengths of tubing and round stock. It will hold 15,000 lb of material and automatically feed the entire load through the machine without any attention from the operator. The loading device (at rear of machine) delivers stock to the feeder as required.

Grieder Industries, Inc, Bowling Green, Ohio

MORE DATA? Circle 100, inside back cover





OTHER P&W NUMERICALLY CONTROLLED MACHINE TOOLS

. . . include the No. 2E Vertical Precision Hole Grinder and the 42" Precision Rotary Table.

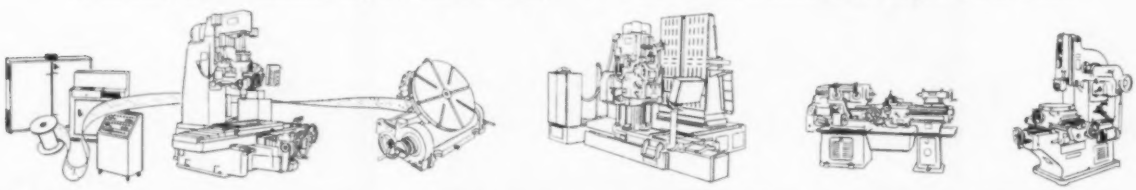
CIRCLE 252 READER SERVICE CARD →

PRECISION JIG BORING TIME CUT 90% . . .

. . . **WITH P&W NUMERICAL CONTROL!** Precision work put on *predictable* production schedules, completed in as little as 1/10 the time required by previous methods. Costly human errors are eliminated. Positioning accurate to "tenths" absolutely guaranteed. These benefits are reported by Dexter Tool Company of Hazel Park, Michigan, since installing a Pratt & Whitney Numerically Controlled Jig Borer. Dexter produces precision aircraft and automotive components. Work involves 6 to 50 identically machined parts, and it's important to guarantee precision, accurately estimate production time and deliver on schedule. Positioning itself automatically by punched tape, the Numerically Controlled Jig Borer handles "tenths" limits as fast and surely as ordinary work. A Dexter spokesman states, "We think the P&W 2E Numerical is the greatest single improvement in machine tooling. It's the ultimate."

Today, "tenths" limits are common, yet profitable operation demands that you produce faster than ever before. Pratt & Whitney Machine Tools with Numerical Control can provide the right answer for you!

Write now for complete information.
Pratt & Whitney Company, Inc.
Charter Oak Boulevard, West Hartford, Conn.



NUMERICAL CONTROL . . . JIG BORERS . . . ROTARY TABLES . . . KELLER MACHINES . . . LATHES . . . VERTICAL SHAPERS

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

Magnesium angle plates are available in four standard heights: 24, 30, 48, and 72 in. Special units up to 120 in. can be supplied. Models have hardened steel runners on the base so that they can be used on semi-steel surface plates without wearing. They are also provided with 8 x 8-in. hardened steel plates to which standard magnesium height blocks can be fixed for increasing height.

Challenge Machinery Co, Grand Haven, Mich

MORE DATA? Circle 101, inside back cover

Aluminum threaded inserts for molding in plastics, rubber, and ceramics may be used separately or combined as male and female components of two halves of a molding. Type C are tapped with Class II threads to conform to ASME specifications in thread sizes from 4-40 to ¼-28. This type is made with a countersunk hole and shoulder to accommodate Type D insert or other threaded stud. Type D inserts are threaded in the same sizes; when used with Type C they can be screwed to butt flush with the shoulder of the female.

Yardley Precision Products Co, 35 Afton Ave, Yardley, Penna

MORE DATA? Circle 102, inside back cover

Decorative expanded metals are introduced in three new patterns, Armorweave and Festoon in 1½-in. wide mesh openings, and Cathedral. Aluminum or carbon steel sheets, available in standard sheet sizes or sheared to specifications, may be curved, formed, welded, and cut without raveling. Variety of finishes may be applied.

US Gypsum Co, 300 W Adams St, Chicago 6, Ill

MORE DATA? Circle 103, inside back cover

Thread-gage lubricant, Micronoil Gage-Lube, is guaranteed to give 100% longer service from close tolerance gages. It is non-gumming, non-loading, providing easier and faster gaging. Prices range from $15 for one dozen 4-oz bottles to $112.50 for a 5-gal lot.

Protective Coatings, Inc, Box 3985, Detroit 27, Mich

MORE DATA? Circle 104, inside back cover

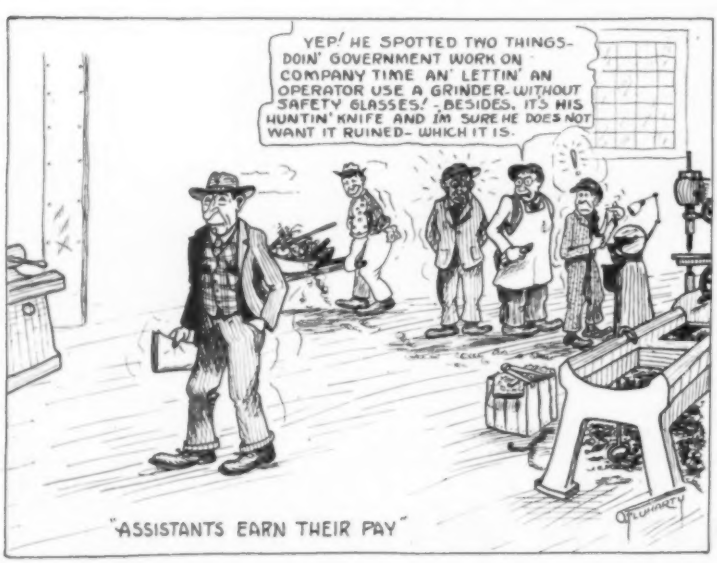
Air filter thoroughly removes harmful moisture, rust, pipe scale and other contaminants from airlines, to prevent damage and excessive wear to pneumatic equipment. Filter was designed specifically for use in connection with the company's matched-set air line lubricators but may be used in other air line lubrication systems.

Gits Bros Mfg Co, Pneumatics Div, 1866 S Kilbourn Ave, Chicago 23, Ill

MORE DATA? Circle 105, inside back cover

Heavy-duty steel belt for handling of press scrap, turnings, chips, parts, assembly, is furnished in conjunction with Prab's side sections to form an enclosed, self-supporting conveyor elevator. Belt has 6-in. pitch with ¾-in. through pin, 3/16-in. thick steel or other metal. Hinges are continuous across width to elimi-

(continued on page 120)


YEP! HE SPOTTED TWO THINGS- DOIN' GOVERNMENT WORK ON COMPANY TIME AN' LETTIN' AN OPERATOR USE A GRINDER WITHOUT SAFETY GLASSES! - BESIDES, IT'S HIS HUNTIN' KNIFE AND I'M SURE HE DOES NOT WANT IT RUINED- WHICH IT IS.
"ASSISTANTS EARN THEIR PAY"

Let me show you*

**Bob Marr,*
P&J Representative
Houston, Texas
Telephone: MOhawk 7-3964

how two P&J Automatics helped Rockwell Manufacturing Co.

JOB FACTS:

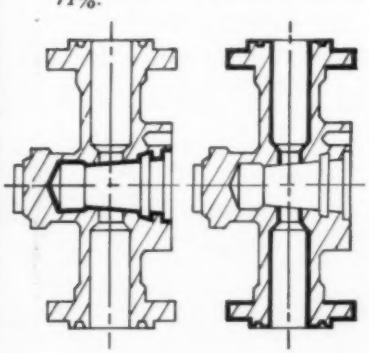
PART: *Valve Body*

MATERIAL: *Steel Forging*

REQUIRED: *A series of 22 roughing and finishing cuts involving very heavy metal removal*

THE MACHINES: *2 P&J 4-U Automatic Turret Lathes*

THE RESULTS: *A part completed in only 3 fully automatic cycles... with machining time reduced 71%.*

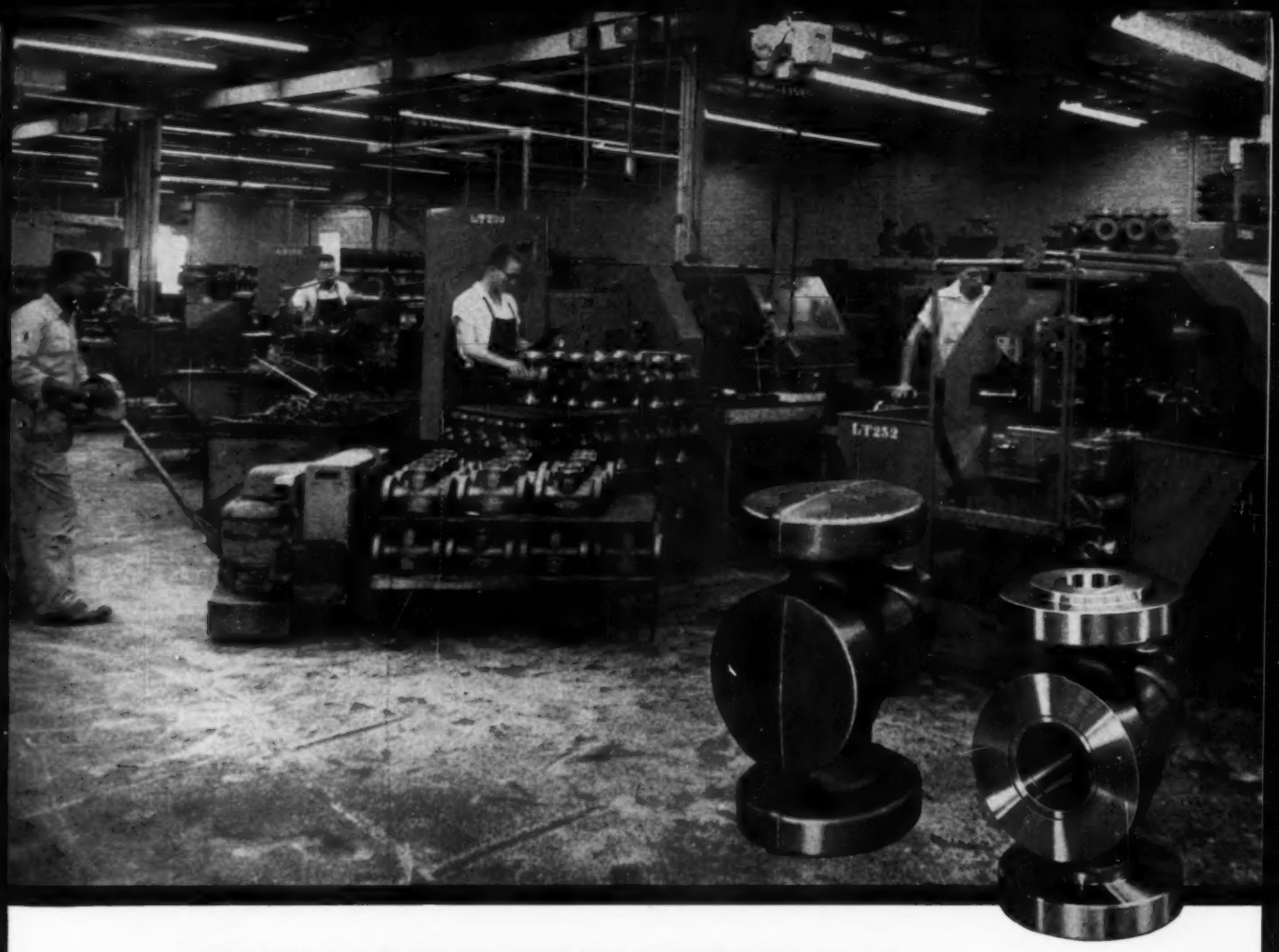


FIRST OPERATION

SECOND OPERATION

BLACK AREAS INDICATE METAL REMOVED

CIRCLE 254 READER SERVICE CARD

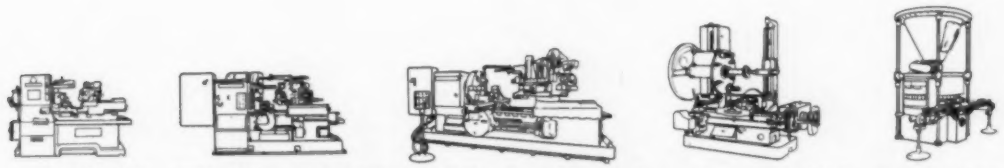


. . . . REDUCE MACHINE-HOURS 71%!

The Rockwell Manufacturing Company of Sulphur Springs, Texas, a leading producer of valves for petroleum and other industries, was using hand-type turret lathes to produce finished valve bodies from rough steel forgings. Looking for a way to reduce costs on this operation, Rockwell purchased two Potter & Johnston 4-U Automatic Turret Lathes. Machine-hours for this operation have been reduced 71% and man-hours have been reduced 86%. In addition, the hand machines and their operators have been released for other work they can handle more profitably, and overall plant production has been increased.

If the parts *you* manufacture require a series of complex cuts, a P&J Automatic can bring you important savings in time and money by producing these parts in a high-speed, fully automatic cycle. And you'll find that P&J Machines are recognized for their ability to take continuous heavy-duty operation in stride.

Act now. Ask the P&J Representative in your area to recommend a production plan for your specific needs. Or, if you prefer, write direct to Potter & Johnston Company, Pawtucket, Rhode Island.



AUTOMATIC TURRET LATHES . . . GEAR CUTTERS . . . PACKAGING MACHINES

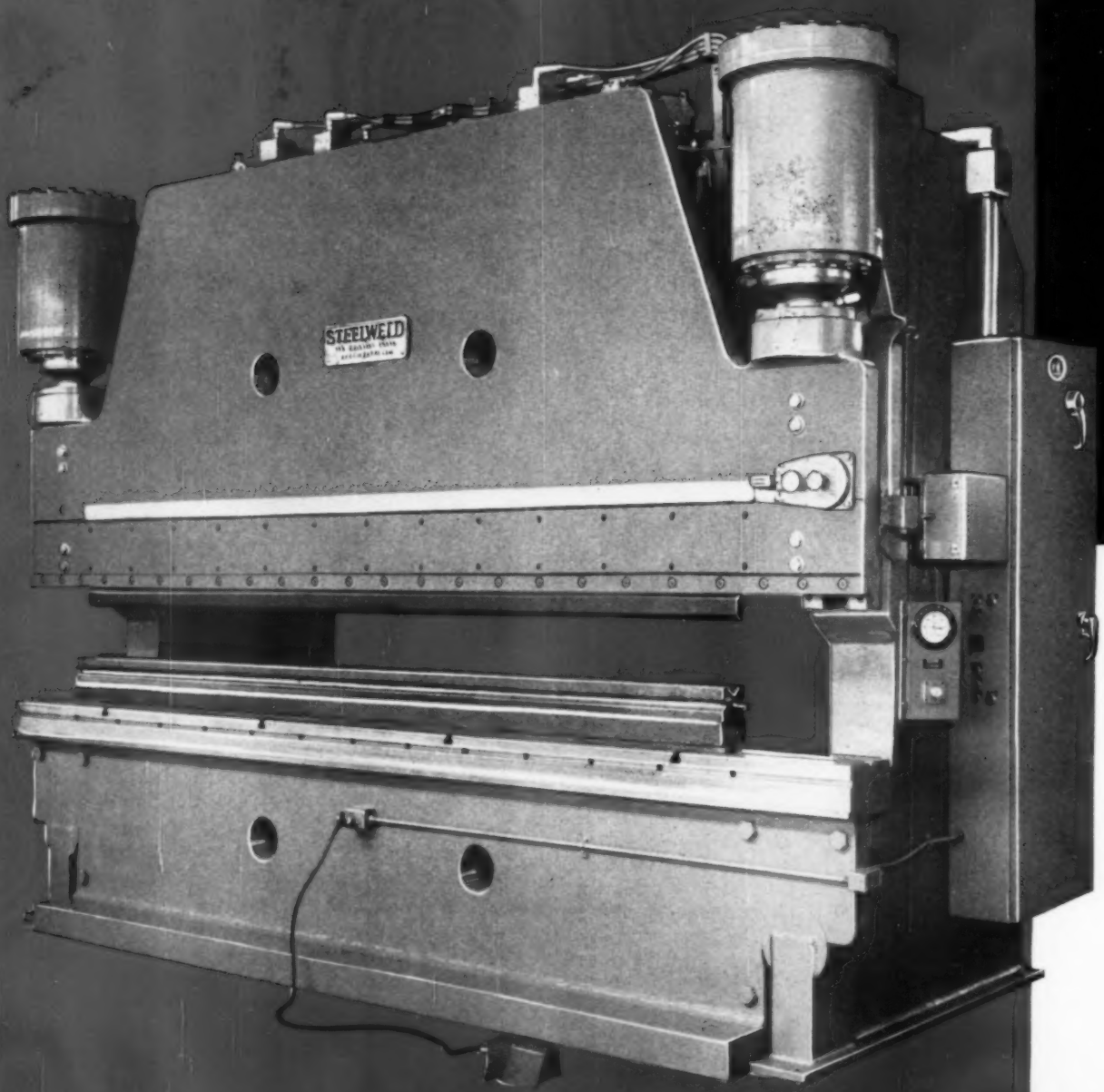
POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898

CIRCLE 255 READER SERVICE CARD

Introducing a



Write today:

Ask for free copy of Catalog No. 2024A

NEW LINE of

STEELWELD HYDRAULIC PRESS BRAKES

Capacities to 2000 Tons

- Positive overload protection.
- Constant power during entire stroke.
- Ram reversible at any point.
- Stroke quickly adjusted for any length.
- Fast ram approach and return—slow-speed pressing.
- Operating pressure simply adjusted.
- Accurate ram level automatically maintained.
- Ram easily tapered.
- Simple, safe to operate.

CLEVELAND CRANE is proud to present its completely new series of Steelweld Hydraulic Press Brakes for bending mild steel from 10 gauge to 2 inches and in lengths to 30 feet.

Heavily built and of finest quality throughout, the machines are of the most advanced design with all features found desirable for ease of operation, maximum production and outstanding performance.

Steelweld hydraulically operated brakes are versatile machines capable of handling a wide variety of operations. They are ideal for jobbing shops, as well as for mass-production work. They work to close tolerances and have ample speed.

The new line of hydraulic brakes supplements the Steelweld line of mechanical press brakes, which Cleveland Crane has been building for more than 25 years, but does not supplant it. Each type of machine has its advantages and careful consideration must be given to the specific application to determine the type and size machine most suitable.

We urge you to get the facts on these new machines that have so much to offer you. Our sales engineers will be glad to give you the details. Or write for our new catalog below.

STEELWELD PRESSES

THE CLEVELAND CRANE & ENGINEERING CO.

1469 EAST 281 STREET, WICKLIFFE, OHIO

CIRCLE 256 READER SERVICE CARD

LARGEST
Line of "Standard"
Precision Ground
SOLID CARBIDE TOOLS
and BURS AVAILABLE
All Atrax tools are precision ground from Solid Tungsten Carbide. Constant improvements in manufacturing techniques, off-the-shelf SERVICE on over 940 "standard" tools mean economy, uniformity and production PROFIT IMPROVEMENT. Atrax Tools are the "standards" of the solid carbide tool industry.
Atrax
Send for the Atrax "Standard Solid Carbide Tool Reference", 96 pages!
Background photo Yerkes Observatory
THE ATRAX COMPANY Newington 11, Conn.

nate gaps. Wheels are solid steel, size 2 in. and 2⅝-in.-dia standard, with 1½-in. face.

Prab Conveyors, Inc, 30121 Groesbeck Hwy, Roseville, Mich

MORE DATA? Circle 106, inside back cover

Perma-Pad C-Clamp swivel pads (*AM*—Nov 18 '57, p212) are available for installation on any clamp. Only tool needed is a screwdriver. These "loss-proof" swivels are held on by a retaining ring instead of by crimping, and have a free swing through a 60° arc.

Wilton Tool Mfg Co, Inc, Schiller Park, Ill

MORE DATA? Circle 107, inside back cover

3-fluted Burr-Bit designed to fit 3-fluted taps is available in sizes from No. 6 to ½ in. As tap is withdrawn from the hole, Burr-Bit (slipped on tap) removes the first thread that creates the burr, leaving a perfectly smooth chamfer. It may be used with friction tapping heads or leadscrews on single or multiple units as well as on hand tapping fixtures.

Vernon Devices, Inc, 481 E Third St, Mount Vernon, NY

MORE DATA? Circle 108, inside back cover

Solid film lubricant, Surf-Kote M-1284 containing molybdenum disulfide, reportedly eliminates galling and seizing under extreme pressures and temperatures, and is inert to unusual atmospheres. Manufacturer claims that it will also speed up

"What darling safety glasses."

parts assembly, prevent fretting corrosion, and facilitate break-in lubrication of engine parts and other components.

Hohman Plating & Mfg Co, 814 Vermont Ave, Dayton 4, Ohio

MORE DATA? Circle 109, inside back cover

Pressure Sensitive Teflon tape can now be attached to metals, wood, rubber, glass, plastics, and other rigid materials by contact. It is produced in sizes ½ in. up to 12 in., 0.005 in. thick, packaged on standard 100-ft spools.

Flexrock Co, Packing Div, 3600-A-Filbert St, Philadelphia 1, Penna

MORE DATA? Circle 110, inside back cover

Mist coolant system, Spraymist, is available as a separate package for mounting on all existing Black Diamond and Worcester drill grinders, or as an optional extra on new models. System includes the unit, extension tube, jet and dual hose; requires only a standard connection to shop air supply. Bulletin available.

Black Diamond Saw & Machine Works, 119 North Ave, Natick, Mass

MORE DATA? Circle 111, inside back cover

Profiling tool features a two-piece shim designed to eliminate insert shifting. Tool is available in a range of sizes and styles for use with leading makes of profiling machines.

Kennametal Inc, Latrobe, Penna

MORE DATA? Circle 112, inside back cover

Pneumatic tool, Dotco Model 2GL for grinding, burring, and finishing operations, is reportedly cool-running up to 25,000 rpm. Heavy-duty, rotary-vane type unit is equipped with Erickson 200 series collets as standard and can accept ⅜-in. shanks of larger wheels, burs, and sanding disks. Tool has over-all length of 5¾ in., weighs 1 lb 5 oz.

Doeden Tool Corp, Sherwood, Ohio

MORE DATA? Circle 113, inside back cover

Cutoff tool, designated No Flex, is designed to eliminate vibration by providing substantial support directly below the cutting edge. Any tip, from HSS through carbide, can be used to its maximum cutting ability. Tool can be quickly reground to produce a new cutting edge. Toolholder prices range from $28.80 to $57; blade prices, from $7.70 to $10.60.

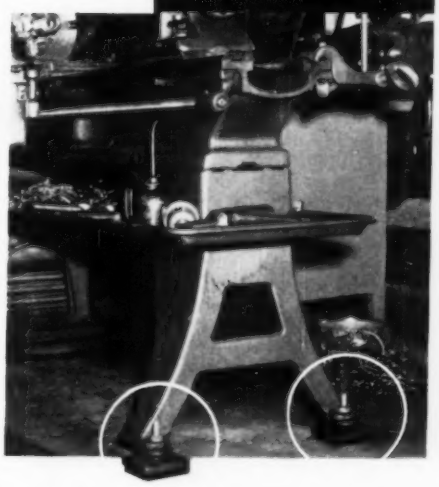
General Machine Co, Inc, Emmaus, Penna

MORE DATA? Circle 114, inside back cover

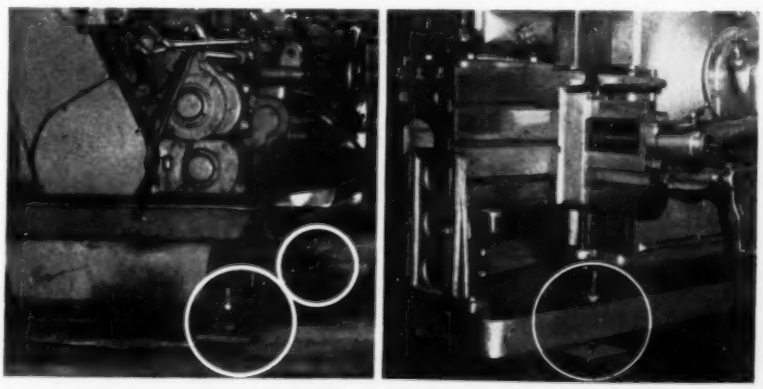
NEWS ABOUT MACHINE MOUNTS

"UNISORB LEVEL-RITES CUT MACHINE MOUNTING TIME BY 75%!"

SAYS DAKE CORPORATION



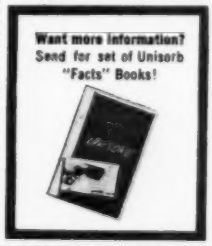
New Unisorb Level-Rite Mounts are providing vital money-saving benefits for plants. Dake Corporation — moving machine tools into their new Grand Haven, Michigan plant — found they saved approximately 75% in mounting time. Plus . . . machines have less vibration, are quieter, can be quickly and easily leveled at any time and are always ready for relocation.



Get these savings for your plant! Try Unisorb on special Trial Offer — if not satisfied your money will be refunded. Write or call today.

UNISORB
Division of The FELTERS Company

200 SOUTH ST.
BOSTON 11, MASS.



Please send me a set of Unisorb "Facts" Books and trial offer request.

Company.....

Name.....

Address.....

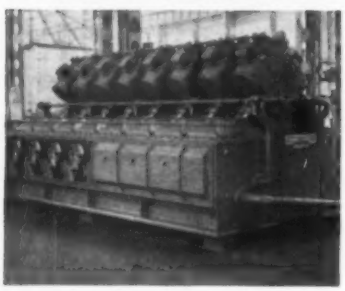
City..... Zone.... State.....

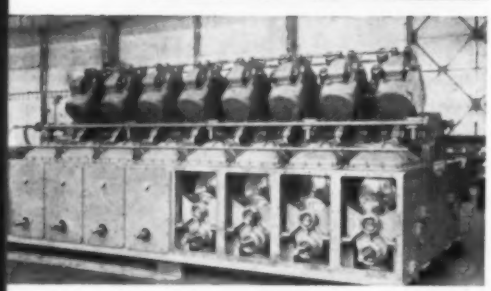
INNOCENTI

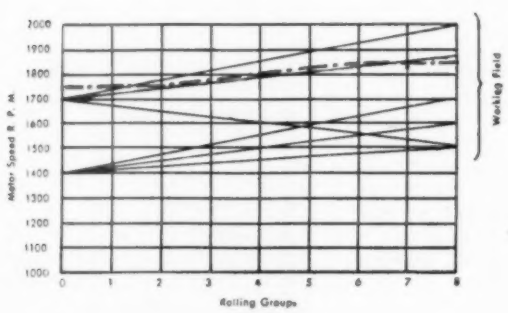
Stretch

Works in Milan (Italy)

Stretch reducing Mills for seamless and welded tubes production; equipped with two Roll or three Roll stands. Direct current independent motor driving for two stand working unit. Electric speed regulation allows variation of the speed curve into a large field even with the mill in operation. Inlet section can be reduced of 6-7 times. Simultaneously thickness reduction can reach the minimum commercial value. Both types of mills are available equipped with number of stands ranging from 12 to 25 according to the producing programs Semi automatic device for quick replacement of stands. Special lathes for cylinder contour rectification. **Using stretch reducing mill it is possible to produce the whole commercial standard of tubes from 3/8". Feeding into the mill welded or seamless, large diameter or high thick-**

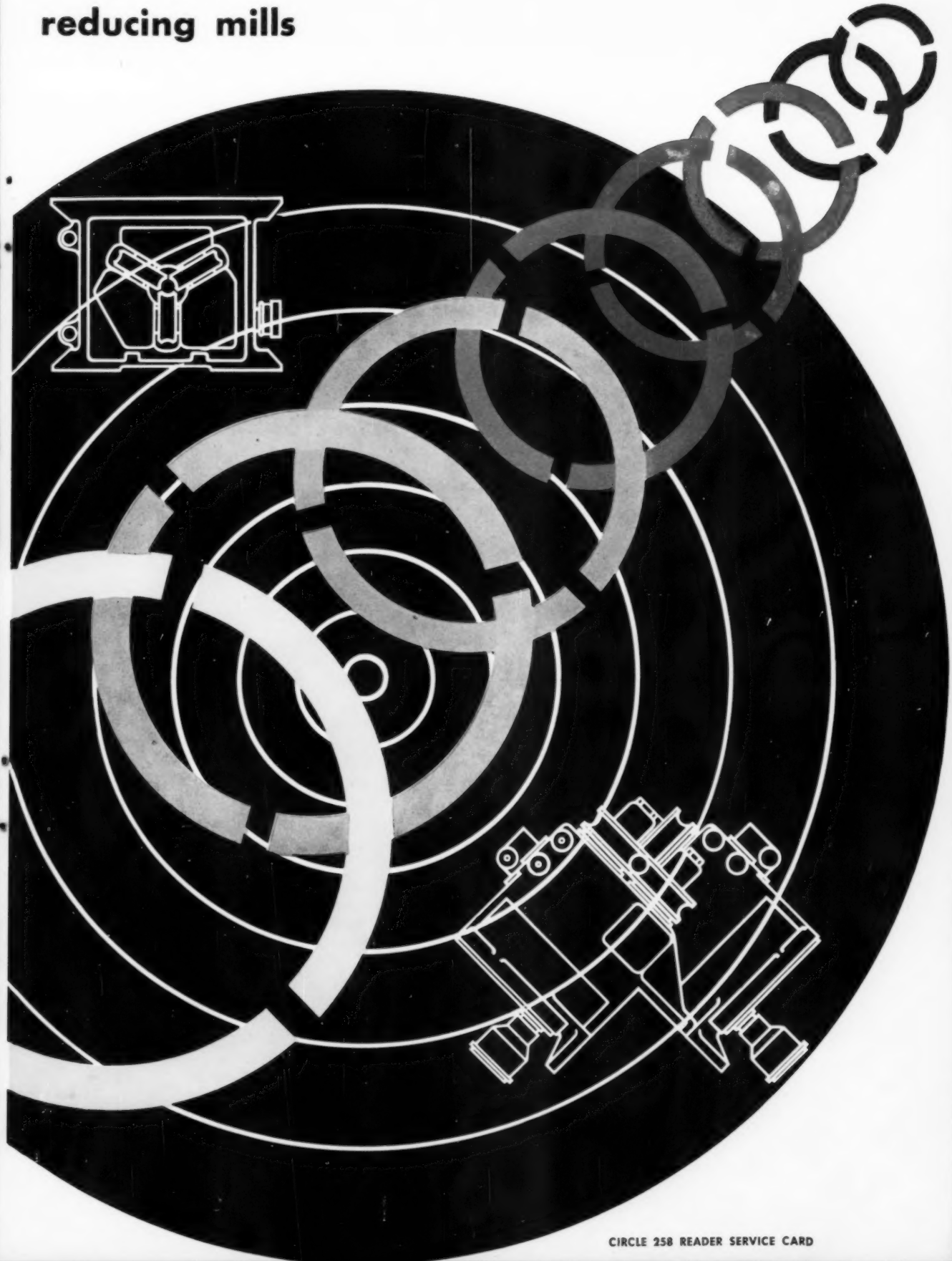






ness tubes, the production average of your plant can be doubled.

reducing mills



CIRCLE 258 READER SERVICE CARD

PRODUCING

LE MAIRE

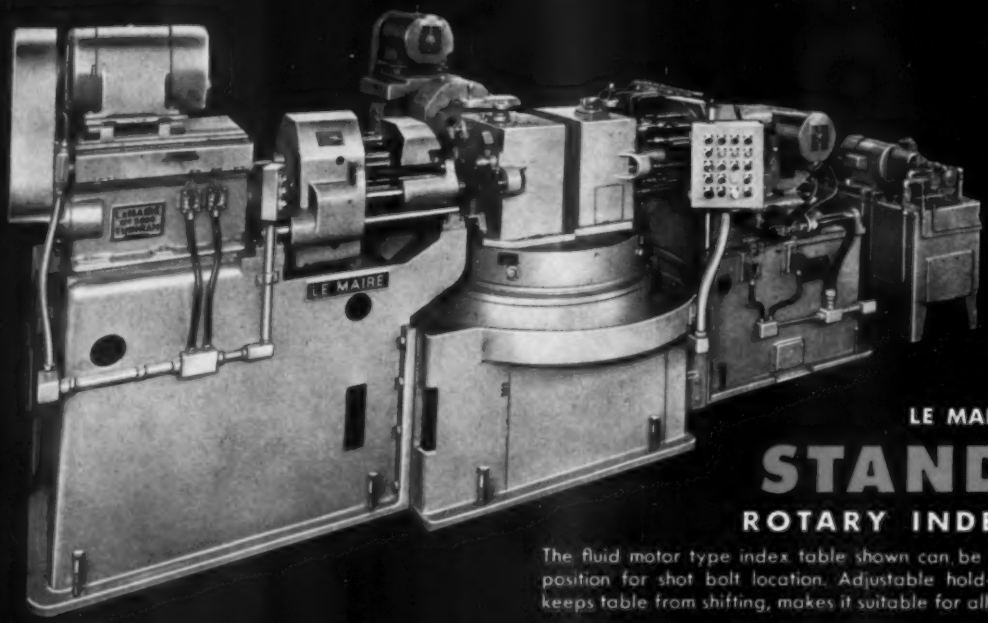
STANDARD
MILLING HEAD UNITS

Vertical milling head cleans up mounting face of oil pump covers. Other operations on this machine include drilling and reaming. Production is 90 parts per hour at 100% efficiency.

LE MAIRE

STANDARD
DRILLING UNITS

Multiple tooling on standard units performs drilling, reaming, counterboring and tapping of 75 flywheels hourly. While units shown are quill type, LeMaire also manufactures standard way type units.



LE MAIRE

STANDARD
ROTARY INDEX TABLES

The fluid motor type index table shown can be set to stop in exact position for shot bolt location. Adjustable hold-down arrangement keeps table from shifting, makes it suitable for all types of machining.

with LE MAIRE

STANDARD BUILDING BLOCKS

Give You Economy . . . Flexibility . . . Simplicity

Before you automate . . . *investigate* the complete LeMaire line of standard hydraulic power units. Each is practical, efficient, economical . . . and nearly as flexible in application as a standard electric motor!

These LeMaire "building blocks" are designed for interchangeable installation on a wide variety of standard bases. This allows low-cost unitized construction, in minimum lead time, of a "special" which solves *today's* production machining problem . . . and which can be economically converted or modified to meet *future* needs.

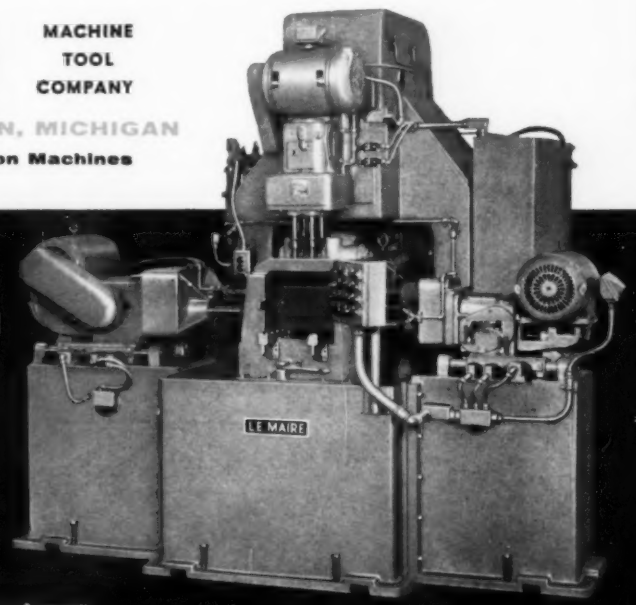
LeMaire standard units are suitable for drilling, boring, counterboring, reaming, spot-facing, tapping and milling. They operate in horizontal, vertical or angular positions. Infinite control of feeds is provided, along with construction which assures twist-free, straight line, uniform operation under all production conditions. All units are built to J.I.C. standards.

For practical, economical, flexible automation, check the possibility of using LeMaire "do-it-yourself" building blocks . . . or ask LeMaire engineers to recommend the right combination for your specific production machining problem. Send parts or prints for prompt recommendations.

LE MAIRE
MACHINE TOOL COMPANY

2657 S. TELEGRAPH ROAD • DEARBORN, MICHIGAN

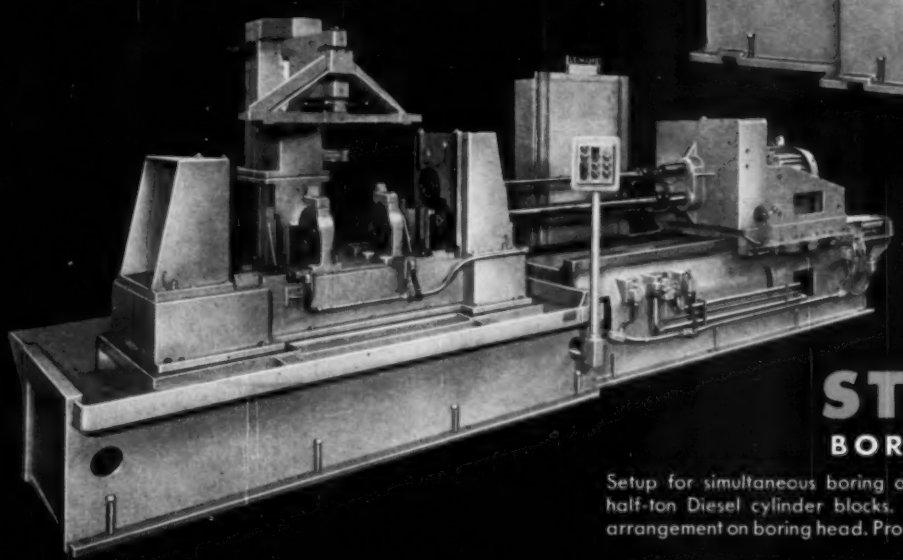
Designers and Builders of Special High-Production Machines



LE MAIRE

STANDARD
LEAD SCREW TAPPING UNITS

Four sides of farm tractor hydraulic reservoir are tapped at once by this machine, arranged with various size master lead screw tapping units. Production is 56 parts per hour at 100% efficiency.



LE MAIRE

STANDARD
BORING HEAD UNITS

Setup for simultaneous boring of camshaft and crankshaft bores in half-ton Diesel cylinder blocks. Way type unit has tool positioning arrangement on boring head. Production is 9.4 cylinder blocks per hour.

Now...

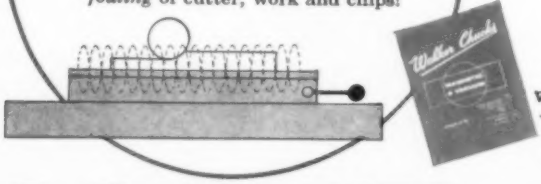
**THE WORLD'S FINEST 10 x 15"
PERMANENT MAGNETIC CHUCK***

The new 10″ x 15″ O. S. Walker chuck, with super-strong ceramic magnets, has licked every problem formerly associated with this size. You get maximum holding power, without expensive wiring and controls, yet you get *complete demagnetization* in the "off" position. The "on-off" lever is extremely easy to actuate. The 10″ x 15″ weighs only 69 lbs. and is just 2⅝″ high, thus minimizing machine table inertia, while leaving maximum machine capacity. The face of the chuck is *all* steel (no soft insulating material) to assure flatness, parallelism and dimensional stability. Fine pole divisions, with ¼″ bar poles, hold even thin or narrow work tightly and uniformly over the entire face. Other permanent chucks with ceramic magnets are available in sizes 6″ x 10″, 6″ x 12″, 6″ x 18″ and 8″ x 24″ — the most complete line anywhere.

*Patents Pending

Perfect for milling, too!

Walker permanent chucks have exclusive construction with magnets polarized *horizontally*. Cutter is constantly *demagnetized* as it progresses, with *no fouling* of cutter, work and chips!



Write for new Catalog 58 — it gives complete details on the Walker line of permanent, electro and vacuum chucks.

O. S. WALKER COMPANY, INC.
WORCESTER 6, MASSACHUSETTS, U.S.A.
The Original Designers and Builders of Magnetic Chucks

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 VERTICAL PROFILER—*Pratt & Whitney Co, Charter Oak Blvd, West Hartford, Conn.* 12-page booklet gives details on the Magnespark, a new concept in tracer control for completely automatic 360° profile milling operations. Unit operates from a sheet steel profile templet to produce any two-dimensional shape, either a straight line or any irregular contour, with speeds up to 60 ipm, and exceptional accuracy. Construction features illustrated.

2 AUTOMATIC DRILLING AND TAPPING UNITS—*Hypneumat Inc, 647 W Virginia St, Milwaukee 4, Wis.* 28-page bulletin 5810 illustrates and describes variety of air or hydraulic powered models. Construction features, applications, specifications, ordering data.

3 SECOND-OPERATION MACHINES *Economy Engineering Co, Willoughby, Ohio.* Descriptive circulars available picture and give data on a semi-automatic pointing machine; a double and automatic pointing machine; an automatic shaving machine; and Type 4600 and Type 3300 automatic pointing machines. Typical operations performed, specifications.

4 1-TON MULTIPRESS — *American Brake Shoe Co, Denison Engineering Div, 1160 Dublin Rd, Columbus 16, Ohio.* 8-page bulletin 310-A describes operation and provides application suggestions on use of press for all types of metal forming and assembly operations; adaptable to manual, automatic, and semi-automatic production operations.

5 COUPLING TAPPING MACHINES —*Landis Machine Co, Waynesboro, Penna.* 12-page bulletin E-98-1 illustrates and describes design and operating features of Models 48TA and 77TA automatic units for high production precision internal threading of oil tubular couplings.

6 TITANIUM MACHINING—*Mallory-Sharon Metals Corp, Niles, Ohio.* 8-page brochure discusses fundamentals, factors which affect machinability, and basic requirements necessary. Suggested speeds, feeds and tool angles given; data included on the cutting tool for each type of titanium or titanium alloy being machined.

7 GRINDERS—*Thompson Grinder Co, Springfield, Ohio.* 8-page catalog T558 covers Types B and C Truforming units. Drawings illustrate operation; case histories of typical jobs included; auxiliary equipment and specifications listed.

8 MULTIPLE ROTARY SLITTING LINES—*Yoder Co, 5500 Walworth Ave, Cleveland 2, Ohio.* 76-page illustrated handbook discusses design, selection, and operation of slitters and slitting lines. Methods of coil handling, scrap disposal, and other operating data included. Second section contains specifications, capacity tables, and additional data on slitters, uncoilers, recoilers, coil cars, and scrap choppers.

9 TEFLON MACHINING TECHNIQUES—*Tri-Point Plastics, Inc, 175 I U Willets Rd, Alberton, LI, NY.* 10-page technical report describes selection and treatment of plastic stock needed for successful end-product machining and performance. Types of cutting and forming tools, precautions on cutting edges, speeds, feeds, and order of machining discussed.

10 CONTROL MECHANISM FOR TURRET LATHES — *De Silvey Corp, 200 Pennsylvania Ave, East Aurora, NY.* 7-page catalog presents illustrated description of the De Silvey Director, a

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

control unit which performs automatically all turret lathe functions previously done by hand. Unit permits lathe to be operated fully automatic, semi-automatic, or completely manual; operator controls all operations from the control panel.

TOOLS AND ACCESSORIES

11 MEASURING INSTRUMENTS — *Ealing Corp, Box 91, Natick, Mass.* 28-page catalog describes products and components including measuring microscopes, cathetometers, optical benches, and accessories for use with each.

12 ROTARY TABLES—*Pratt & Whitney Co, West Hartford 1, Conn.* 23-page illustrated circular 619 gives detailed descriptions of tables for inspecting, machining, and graduating, available in horizontal, vertical, and tilting types; optical, numerical control, and manual set models.

13 METALWORKING TOOLS — *L-W Chuck Co, 25 S St Clair St, Toledo 4, Ohio.* 8-page illustrated brochure contains information on new Adjusto-Quick drill-press vise, plus many of company's products including lathe chucks, dividing heads, milling machine vises, magnetic chucks, demagnetizers, and rectifiers.

14 METAL SHEET FEEDER—*Dexter Co, Division of Miehle-Goss-Dexter, Inc, Pearl River, NY.* 6-page folder presents data on 6000-lb capacity Model TF-6 that automatically feeds sheets from 38 to 25 gage at speeds to 85 per min; can be reloaded while running.

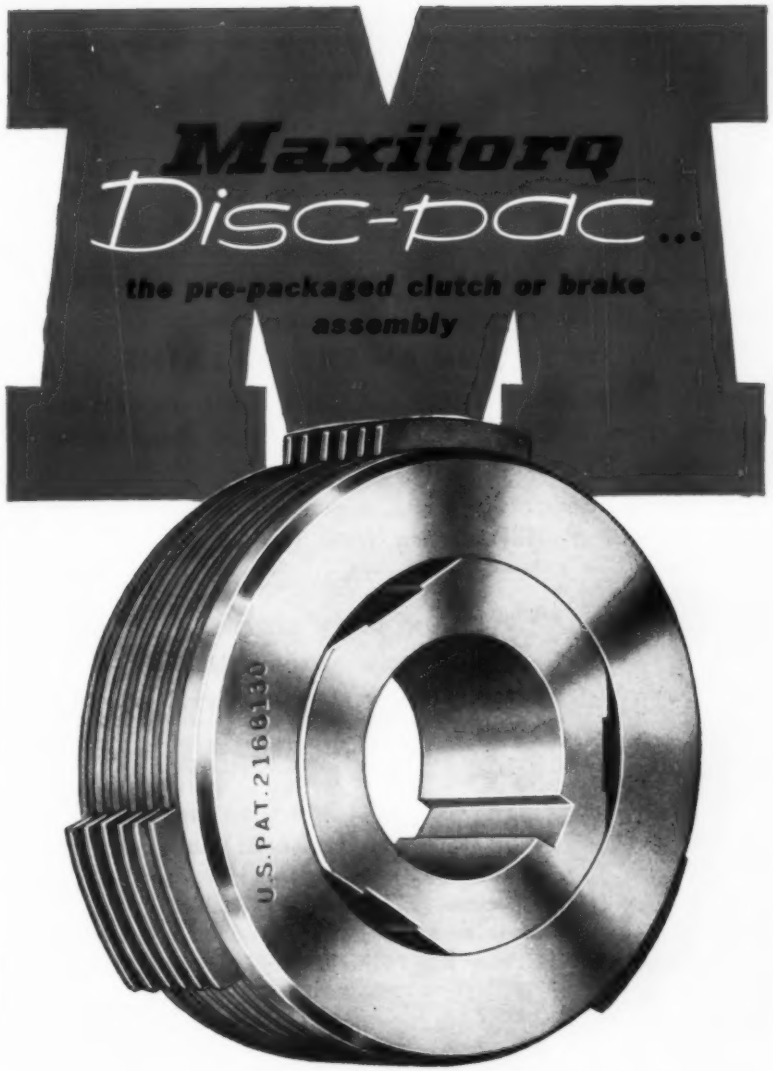
15 UNIVERSAL JIG AND FIXTURE SYSTEM — *Wharton Unitools, PO Box 202, Valley Stream, LI, NY.* Literature outlines improvements: basic unit has been enlarged from 450 to 560 parts; seven fixtures can be made at one time; second baseplate is now included in the outfit; set of three shadow boards is included.

16 HONING COMPUTER — *C Allen Fulmer Co, 1200 First National Bank Bldg, Cincinnati 2, Ohio.* Slide-rule-design instrument for calculating honing time on any size cylinders provides necessary information on surface speed, stone selection, approx removal rates, how much stock to hone, floor to floor time. Additional data may be gathered from the computer as to material used, stone composition with various speeds, and cost in comparison with other types of metal removal.

17 FLEXIBLE SHAFT EQUIPMENT—*Wyzenbeek & Staff, Inc, 223 N California Ave, Chicago 12, Ill.* 8-page catalog 58 contains illustrated descriptions of complete line of flexible shafts and flexible shaft machines, plus expanded line of accessories. Includes WYCO Quick Change Angle heads and hand pieces; wire brushes, grinding wheels, mounted points and other tools for use with WYCO machines.

18 COLLETS—*Sutton Tool Co, Sturgis, Mich.* 4-page bulletin 20 gives detailed tabular information on Diamond Grip line for turret lathes. Solid and master collets and collet pads in all popular sizes are listed for Bardons & Oliver, Foster, Gisholt, Jones & Lamson, Warner & Swasey, and Oster machines.

19 BLAST-ETCH MARKING MACHINES—*Jas H Matthews & Co, 3704 Forbes Ave, Pittsburgh 13, Penna.* Bulletins 146-C25 and 146-C26 describe line of Airgrit units from standard stationary models to portable and inspection type. Equipment is especially designed for marking polished surfaces, precision finished parts, glass, ceramics, carbide.



Takes performance guesswork out of power transmission design

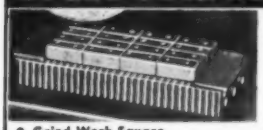
With these performance-proved units, you can save time and money in designing and building clutches and brakes exactly tailored to the requirements of your application. At the same time, you can be sure that they will equal the performance and smooth operation of proved MAXITORQ clutches and brakes. DISC-PACS are simply the "heart" of a clutch or brake . . . the discs, separator springs, and locking plate . . . supplied as a complete self-contained unit for the convenience of design engineers and equipment builders.

Produced in a full range of sizes and capacities from ¼ h.p. to 15 h.p. Bulletins available on other MAXITORQ products: Floating Disc clutches and brakes, Electric clutches, Overload Release clutches, low-cost Single Disc clutches, and clutch or brake friction discs. Write Dept. AM-7.

THE CARLYLE JOHNSON MACHINE CO.
Manchester, Connecticut

IC-758

SPEED SURFACE GRINDING SET-UPS WITH



MAGNE-BLOX
LAMINATED PARALLELS AND V-BLOCKS
Save Your Magnetic Chucks
Eliminate Clamps
Eliminate Holding Devices

- Grind Work Square
- Grind Work Parallel
- Hold Round Pieces

UNIVERSAL SET IN CASE $31.75

WRITE FOR ILLUSTRATED FOLDER

GEO. SCHERR CO., INC. 200AM LAFAYETTE STREET • NEW YORK 12, N. Y.

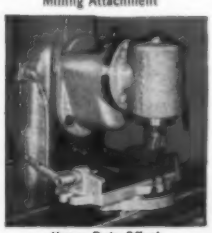
CIRCLE 263 READER SERVICE CARD

HOW TO RUN AN ENGINE LATHE

This 15-page *American Machinist* Special Report discusses engine lathes, and turning tools and operations. Many helpful drawings. 25 cents.

Reader Service Dept., *American Machinist*
McGraw-Hill Building, New York 36, N. Y.

Heavy Duty Vertical Milling Attachment



Heavy Duty Offset Vertical Milling Attachment

Universal Milling Attachment

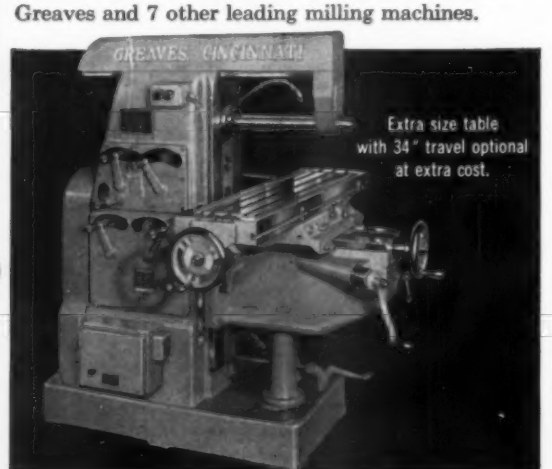
Toolmakers Overarm

Heavy duty attachments increase versatility of dependable, low-cost

GREAVES MILLS

"THE MOST MILL FOR THE LEAST MONEY"

A full line of attachments and accessories offer outstanding flexibility for all types of milling operations . . . with GREAVES MILLS.
Make your own comparison of 22 specifications of Greaves and 7 other leading milling machines.



Extra size table with 34" travel optional at extra cost.

Send coupon for FREE Comparison Chart and detailed descriptive literature on easy-to-use attachments.

GREAVES MACHINE TOOL CO.
2100 Eastern Avenue, Cincinnati 2, Ohio

Send Comparison Chart. I will make my own comparison of GREAVES MILLS with other makes.
Send information on Attachments and Accessories for GREAVES MILLS.

NAME _____ TITLE _____
FIRM _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

20 C-CLAMPS—*Wilton Tool Mfg Co, 9525 Irving Park Rd, Schiller Park,* Ill. Catalog 692 gives data on new design features that include Perma Pad swivel pads, guaranteed never to come off. Redesigned Rapid Titan Quick Acting C-clamp which combines free sliding action with unlimited takeup described, as well as new series of drop forged steel clamps with extra-deep throat.

21 RECESSING TOOLS—*Maxwell Industries, Inc, 493 Fifth Ave, Ashtabula, Ohio.* 16-page catalog T-6 discusses operations and applications in lowcost automation. Typical examples of applications provide ideas for combining two, three, or more machining operations in a single production operation. Special tool designs illustrated.

HEAT TREATING AND WELDING

22 RESISTANCE WELDERS—*Alphil Spot Welder Mfg Corp, 1058 Pacific St, Brooklyn 38, NY.* Catalog covers complete line of resistance welders specifically designed for the sheet metal, wrought iron, wire fabricating and tubing industries. Specifications, applications given for flash, projection, butt, spot, and gun welders for all voltages and frequencies.

23 SILVER-JOINING ALLOYS — *Eutectic Welding Alloys Corp, 40-40 172nd St, Flushing 58, NY.* 24-page illustrated booklet contains comparative analysis chart listing specific properties and uses for eleven silver-bearing alloys. Details heating techniques, including torch, furnace, induction, and other commonly used methods. Problems discussed include tool tipping, electronics, precision production work, with emphasis on joining dissimilar metals, such as cast iron to steel or to copper alloys.

24 SPOT WELDING INCONEL X—*Taylor-Winfield Corp, Warren, Ohio.* 12-page bulletin SP-20 gives recommended welding schedules for spot welding Inconel X in thicknesses of 0.032 to 0.188 in. Covers properties; welding with tri-phase machines; welding with single-phase ac machines; post-weld heat and forging pressure; X-ray examination and spot weld macrographic examination.

PLANT SERVICE EQUIPMENT

25 "PLAIN TALK ON BERYLLIUM" —*Beryllium Corp, PO Box 1462, Reading, Penna.* 12-page booklet deals with industrial hygiene aspects of beryllium metal, oxide, alloys, and other beryllium products that, in some forms and compounds, when improperly handled, constitute a health hazard. Discusses ingestion, cuts, radiation, fire and explosion, beryl ore, and respirators.

26 PUMPS—*Tuthill Pump Co, 939 E 95th St, Chicago 19, Ill.* 12-page catalog 100 contains basic illustrated data on complete line of rotary positive displacement pumps, fluid motors, and valves. Includes descriptions of operating principles and internal construction plus pump guide selection chart.

27 AIR CONDITIONERS — *American Air Filter Co, 215 Central Ave, Louisville 8, Ky.* Illustrated 54-page bulletin 786 describes new line of AAF-Herman Nelson units incorporating Roll-O-Vent automatic air filter. Covers standard accessories available, steps in selection of basic unit and components, capacities, standard arrangements, dimensions.

28 BARREL FINISHING EQUIPMENT —*Lord Chemical Corp, 2068 S Queen St, York, Penna.* 8-page bulletin 158 covers full line of Lorco equipment including

OSBORN® *announces:*

a new concept in power brushing tools

How TY® BRUSHES will significantly cut your finishing costs

Designed for jobs *beyond the reach* of standard wire power brushes, Osborn TY® Tool Brushes are literally a new concept in finishing tools.

Where rotary files, abrasive stones or belts, tumbling and shot blasting equipment have been used—TY Brushing Methods now do many of these jobs *better . . . at significantly less cost.*

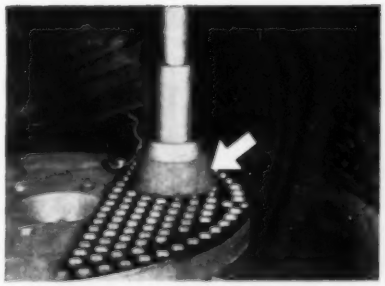
These exclusive TY Brush advantages have been proved through extensive field tests—

- Maximum of work efficiency with minimum of pressure
- Greatly increased brushing action strength
- Positive control over area of brush contact
- Complete uniformity of finish
- Exceptionally long brushing tool life

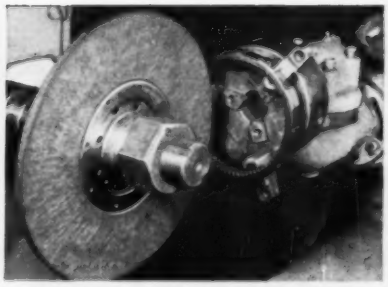
Osborn TY Brushes will give you a higher rate of output . . . better product quality . . . lower end-of-service cost. Write or call us today for full information. No obligation, of course. *The Osborn Manufacturing Company, Dept. C-73, Cleveland 14, Ohio.*

Osborn Brushes

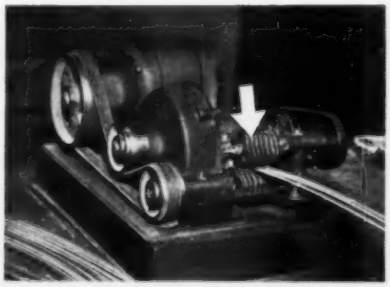
BRUSHING MACHINES • BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY



DEBURRING EDGES OF HOLES *on surface of tube sheet is done faster . . . more thoroughly with Osborn TY Cup Brush on Osborn's Brushamatic® 51-1L Machine.*



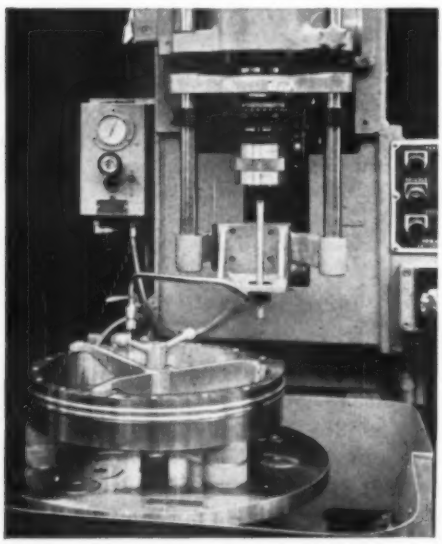
BLENDING GEAR TOOTH EDGES *and deburring in a single precision operation is done with Osborn TY Monitor® Brush running at 1750 rpm on Brushamatic® 3A Machine.*



WIRE STRIPPING *is fast, uniform, low cost with Osborn TY Insulation-Stripping Brushes that fit standard wire stripping machines . . . such as dual-stripper shown.*

WHY Pratt & Whitney MICROHONES Bores In Titanium Spacers

Rotor disc spacers, that are used in jet engines, require accurate bores having consistent surface finish. Thus, the final processing method must generate bores with diametric and geometric accuracies within .0005″ and consistent finishes of 15 microinches.



But, Pratt & Whitney Aircraft Division, U.A.C., faced additional problems in selecting the final processing method for these .110″ length bores in titanium spacers. Because the spacers are manufactured in 20 different heights and bores in two diameters, efficient production demanded extreme versatility of the processing method used.

Here's why Pratt & Whitney chose the Microhoning process and equipment to economically produce the required results: Microhoning, in removing .004″ of stock from each bore, accurately holds to size and finish requirements; and because the fixturing positions all 20 spacer heights at same work level, the tool stroke never needs adjustment. The Microhoning of all 16 bores in each titanium spacer is completed in about 7 minutes (including loading and unloading time).

Learn why Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME _____

TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE ____ STATE _____ L

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

conventional horizontal octagonal barrels in capacities from 0.7 to 36.6 cu ft and the new Loreo vibrator in capacities of 12.70 and 17.50 cu ft; centrifugal dryers; vapor degreasers; and a triple-action, tilting polygonal barrel.

29 BALL BEARING TROLLEYS — *Link-Belt Co, Prudential Plaza, Chicago 1, Ill.* 20-page book 2636 presents data on types and sizes available, selection of new trolleys and attachments, and replacement of units in existing installations. Units are available in two series for operation on 3, 4, or 6-in. I-beam tracks.

30 BULK MATERIAL HANDLING CONVEYOR—*Prab Conveyors, Inc. 30121 Groesbeck Hwy, Roseville, Mich.* 9-page brochure TV-80 illustrates and describes totally enclosed unit featuring a two-directional chain to convey in any direction. Tube-Veyor is designed for continuous removal of chips and scrap material from single unit and multiple unit machine tools; material is automatically deliquefied.

31 FORK LIFT TRUCKS — *Allis-Chalmers Manufacturing Co, Engine-Material Handling Div, Milwaukee 1, Wis.* 16-page catalog BU-451 contains illustrated description of FT series. Covers engineering, design, construction, and operating features.

● ELECTROSTATIC SPRAY EQUIPMENT—*Ionic Electrostatic Corp, 111 Monroe St, Garfield, NJ.* 6-page catalog illustrates and gives data on a number of spray systems featuring ionic guns and centrifugal atomizers. Request direct on company letterhead.

PARTS AND MATERIALS

32 VARIABLE SPEED CONTROLS — *US Electrical Motors Inc, PO Box 2058 Terminal Annex, Los Angeles 54, Calif.* 8-page bulletin F-1882 illustrates and describes operation and application of Varitrol variable speed drive and pneumatic control systems. Includes details on new pre-engineered Varitrol instrumentation packages assembled as plug-in units to provide automation for any production process in which a worker operates a single machine or controls one process.

33 TOOL COMPONENTS—*PIC Design Corp, 477 Atlantic Ave, East Rockaway, LI, NY.* 32-page illustrated pocket-size catalog 16 lists 300 components such as clamps, studs, thumb screws, swing washers, round shafting.

34 STAINLESS STEEL CHART—*Peter A Frasse & Co, 17 Grand St, New York 13, NY.* Chart (Sec A, No. 8) provides data on the relative corrosion resistance of 34 standard grades of stainless. On one side, chart graphically traces developments made in the four basic groups of stainless alloys; on reverse side, each step is clearly reviewed.

35 MAGNETIC AND MOTORIZED VALVES—*Mercoid Corp, 4201 Belmont Ave, Chicago 41, Ill.* 24-page illustrated catalog V-58 lists specifications of units for use with air, water, gas, steam, oil, and refrigerants. Solenoid coil rating tables, flow charts for liquids and for compressible fluids, dimensional drawings included.

36 ADHESIVES, COATINGS, SEALERS—*Minnesota Mining & Mfg Co, 433 Piquette Ave, Detroit 2, Mich.* 23-page catalog lists US Government specifications in numerical form, their definitions, and the corresponding 3M adhesive, coating, or sealer that meets these specs.

FIELD REPORT...

Thompson Products Merges With Ramo-Wooldridge

Thompson Products, Cleveland, and its affiliate, Ramo-Wooldridge Corp Los Angeles, have signed an agreement providing for merger of the two companies. New company, to be known as Thompson Ramo Wooldridge Corp, will have a total employment of more than 20,000. Combined assets will be in the range of $200 million; sales for 1958 are estimated in excess of $300 million.

Western Electric Will Produce . . .

. . . $20.7 million worth of parts for Nike Ajax and Nike Hercules missiles. Work will be done at company plants at Burlington, Greensboro, Winston-Salem, and Charlotte, NC, and in Santa Monica, Calif. Company also has a $9.2 contract for production engineering for the Nike Hercules. Order will be carried out at Whippany, NJ, and Santa Monica.

Lockheed Aircraft . . .

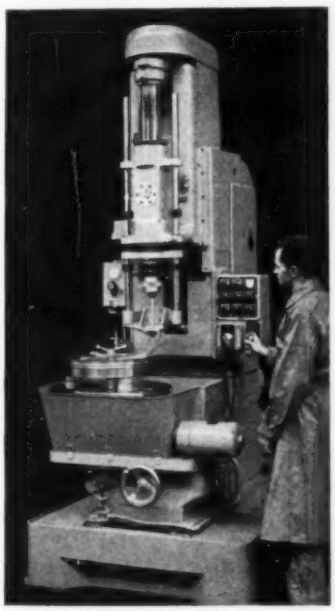
. . . will be steadily decreasing employment at its California and Georgia Divisions while increasing workforce in its Missiles Systems Div. Current total for all divisions is 48,500, about 200 more than first of the year. By year's end total is expected to be about 47,300. Company has orders for 151 Electras, continuing production into 1960 at the California Div. Georgia Div is

(Continued on page 134)

"It's time we thinned out the machines again . . ."

HOW Pratt & Whitney MICROHONES Bores In Titanium Spacers

By Microhoning the bores in rotor disc spacers used in jet engines, Pratt & Whitney obtains final stock removal that efficiently produces close diametric and geometric accuracies (within .0005″) and consistent surface finishes of 15 microinches.



Here's how a Hydrohoner produces these accurate results in 20 different sizes of titanium spacers . . . each spacer having 16 bores that are either .680″ or .590″ in diameter and .110″ in length.

The Hydrohoner is equipped with precise feed and sizing controls that automatically expand and collapse the tool, compensate for abrasive wear, and terminate the Microhoning cycle when required bore size is reached. Also, because fixturing is designed to position all spacers at the same work level, the tool stroke never needs adjustment.

A rotary indexing table automatically locates each bore under the spindle and stops the Hydrohoner when all 16 bores in each spacer are finished. A lateral indexing feature positions the fixture to accommodate various spacer sizes. In fixture change-over, no special tools are required for simple exchanging of four details, and the switch from one spacer size to another requires but a few minutes.

☐ Please send me your movie "Progress in Precision" in time for showing on _____ (date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME _____
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

MICROMATIC HONE CORP.
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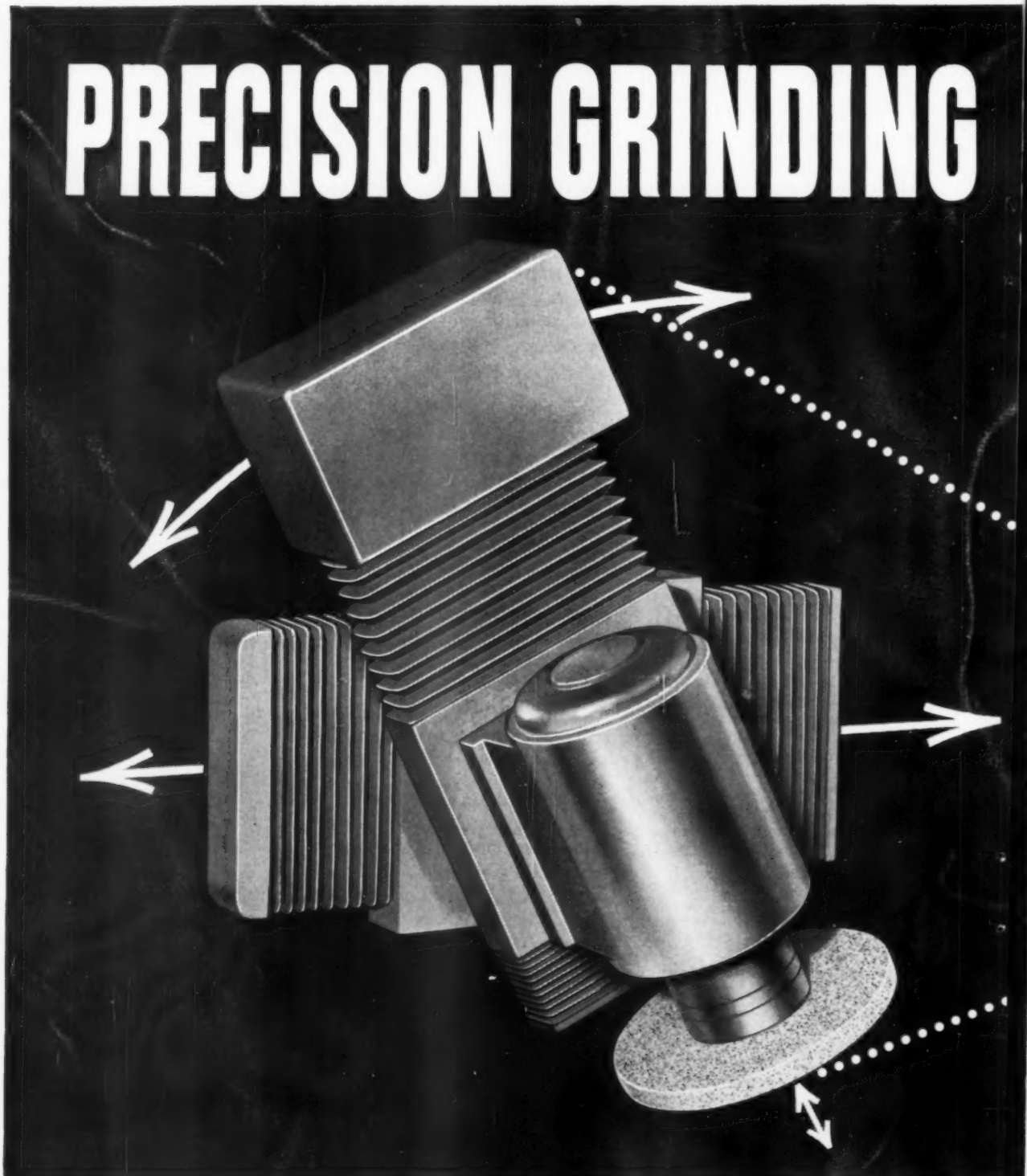
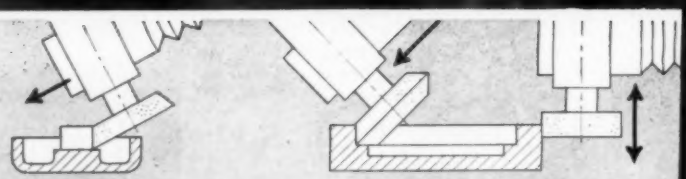
PRECISION GRINDING



Diagrams show typical applications of Frauenthal Standard Slide Units to a variety of grinding problems.



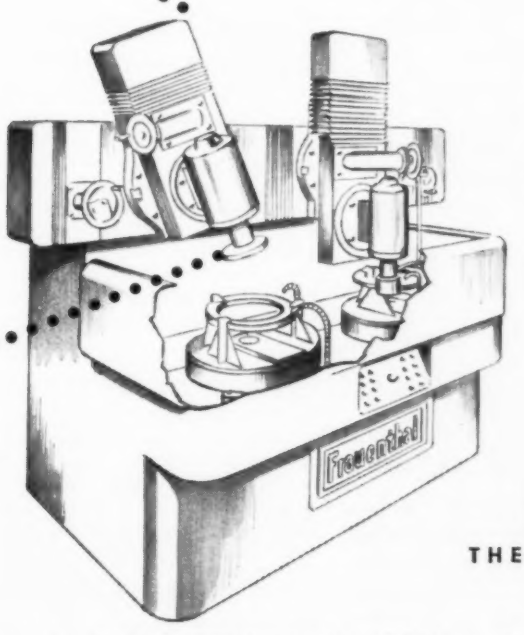
at any angle!

Frauenthal's creative engineering Now makes available Standard Slide Units in any number of combinations for production grinding applications . . .

IT IS NO LONGER NECESSARY to absorb special engineering and design costs when Frauenthal Standard Slide Units — plus a variety of grinding spindles — can be assembled to machine bases appropriate to a particular job. And these standard slides in single or multiple units can be arranged in an infinite number of spindle positions to accommodate an endless variety of simultaneous or sequenced, automatically controlled grinding operations.

What's more, you get all the advantages of Frauenthal's advanced engineering and design experience—proven on single and multiple-head grinders used on special production jobs. For example: parts for jet engines, diesel and automobile engines, tanks, gun mounts, radar units, large and small diameter precision bearings and machine tool components.

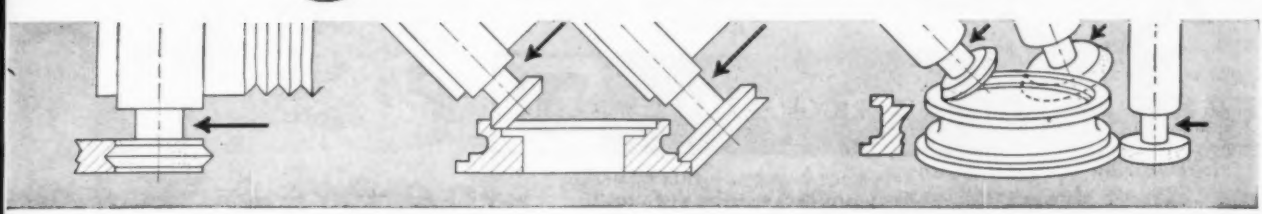
As illustrated here, this model of the versatile grinding compound shows how the Frauenthal Standard Slide Unit can be adapted to approach the work from any desired angle.



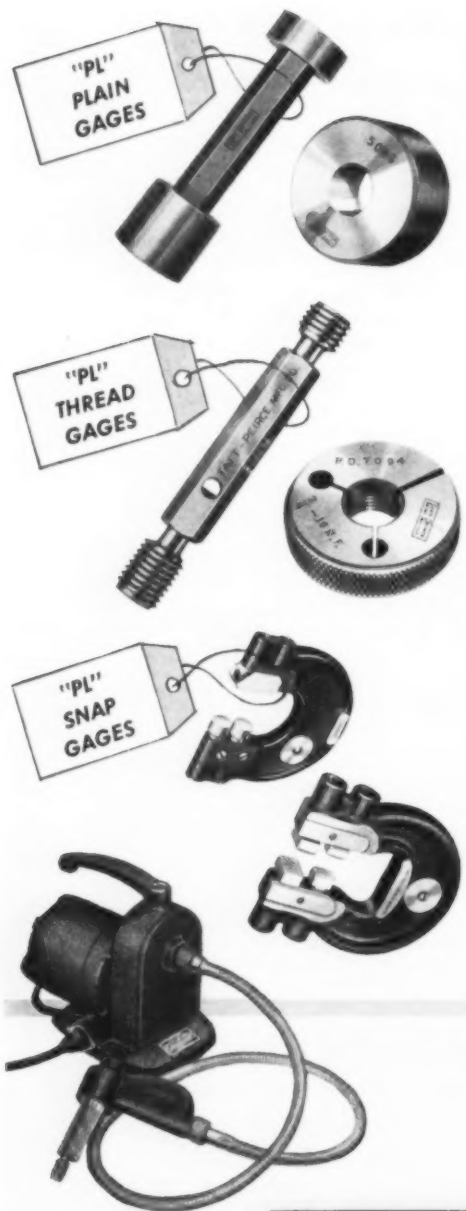
Here's a typical Frauenthal Double Head Vertical Spindle application utilizing two of the Frauenthal Standard Slide Units shown on the opposite page. Although applied to a particular grinding situation, these slide units retain versatility for angular positioning. Frequently, as indicated in panels 2 and 4 at the bottom of the page, diameters and adjacent surfaces are ground at one time with a single wheel dressed to the proper contour.

Send a print of your "problem grinding part" and our engineers will show you how to apply Frauenthal Standard Slide Units to solve the problem. Include in your letter pertinent production information — number of pieces, etc. Be sure to investigate the latest Frauenthal Vertical Grinders with Standard Slide Units. For complete details, contact Frauenthal of Muskegon.

Frauenthal Division
THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN, U. S. A.
F-256



Lower Costs, Improve Quality
WITH
Taft-Peirce
"PL"* Fixed Gages



*"PL" — Precision Lapped, your assurance of these Taft-Peirce Quality Extras . . . accurate sizing, controlled geometry, long lasting wear life.

Taft-Peirce Cylindrical Plug and Ring Gages are furnished in hardened steel, with Electrolized or Chrome hard facing, or with Carbide or Norbide inserts . . . a surface treatment for every gaging requirement.

Taft-Peirce Thread Plug and Ring Gages are available in hardened steel or Electrolized. Thread plugs also are available in Tungsten Carbide for exceptional wear resistance.

Taft-Peirce Plain Adjustable Snap Gages are available with pin type, round, or square anvils, and regular or midget frames. Gaging members of chrome alloy steel, Tungsten Carbide or Norbide inserts. Adjustable Thread Snap Gages available with Tungsten Carbide anvils. Also, Roll Thread Snaps for longer service life.

Mechanize Thread Gaging with the Taft-Peirce Rotochek. Simplified, accurate, low-cost method for quantity inspection of threaded parts.

TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

Field Report . . .

continuing to turn out the C-130 Hercules in quantity. Prospects for an upturn in employment lie with the Missiles System Div where development work is proceeding on the Polaris and work is being done on a super-priority AF contract for a giant earth satellite.

Chrysler's $72.8 Million Order . . .

. . . for 900 M48 medium tanks will provide continued employment through March 1960 for 1400 workers at company's plants at Newark, Del, Scranton, Penna, and Centerline, Mich. General Motors' Allison Div at Indianapolis has a $6.5 million order for the tank transmissions.

Todd Shipyards Corp . . .

. . . reports it will hire a "substantial number" of additional workers if it gets a multi-million-dollar ship conversion job for which it recently submitted low bid. Todd quoted a figure of $6,840,000 for conversion of four government-built mariner-type vessels for American President Lines. Work would be done at the Alameda, Calif, shipyard.

Prop Plane Order Drop-off Reduces Douglas Workforce

Rapidly diminishing order backlog for propeller-driven airplanes (only 41 DC-6 and DC-7 transports) has caused Douglas Aircraft to begin layoff of some 5000 employees at its Santa Monica, Calif, plant. By Dec 1 workforce will have shrunk from

"Simpson got tired of bologna sandwiches every lunch."

Field Report . . .

25,000 to 20,000. Increasing activity in missiles, and production of the DC-8 jetliner prevented the cut from being greater. Company has a $48.8 million contract to turn out launchers for Hercules missiles.

Thiokol Chemical Corp . . .

. . . has a $17.9 million contract for production of solid propellants and motors for Nike Hercules anti-aircraft missiles, Lacrosse bombardment missiles, and air-to-air Falcons. Work will be done at the Longhorn Ordnance Works at Marshall, Texas.

Whitnon Manufacturing Co . . .

. . . has opened a new plant in Detroit that'll specialize in the repair and reconditioning of all types of industrial anti-friction spindles. The Farmington, Conn, company makes spindles for boring, grinding, milling, and drilling.

West Coast Ball Bearing Plant

Work is under way on a 13-acre industrial site in El Monte, Calif, for the West Coast's first miniature ball bearing manufacturing plant. The 23,000-sq-ft facility is being built for Microtech Corp, new subsidiary of Federal-Mogul-Bower Bearings, Inc.

Telecomputing Corp Purchase

Assets of Autron Engineering, Inc, Los Angeles precision instrument manufacturing firm, have been purchased by Telecomputing, North Hollywood, Calif. Autron designs and manufactures a line of electronic and mechanical high-speed counters for data instrumentation systems.

IT&T Components Division . . .

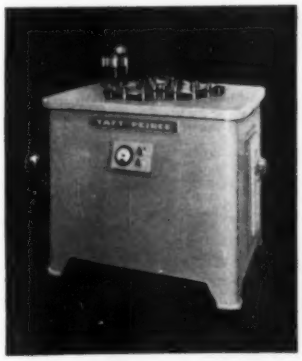
. . . is building a $3.5 million plant in Roanoke, Va, for production of special purpose vacuum tubes. The 58,000-sq-ft facility located on an 18-acre site will be completed by end of the year.

Motch & Merryweather . . .

. . . has acquired the Wink Cutter Division of F J Fink Co, Chardon, Ohio. The Wink Cutter is a precision machine used for cutting rubber, plastic, textile fiber, and other hot or cold extruded materials at extremely high speeds. Wink equipment, to be produced at M&M's Euclid Plant, includes several mod-

This pump casting is having its flange lapped flat to seal a leakproof joint without using gaskets. A wide variety of material can be production lapped on this new machine.

Cut Finishing Time and Costs with this Semi-Automatic Lapping Machine



Delivery from stock!

Machine furnished complete as shown with variable speed-drive motor, compound tank with flexible tube, truing rings, weight plates, and masonite blanks for making your own work retainers.

Now! You can get production lapping with flatness within one lightband (.000011″) and with finish as low as 1 micro inch RMS.

Simple to set-up — easy to use. Mount work-pieces in holding fixtures, set desired time cycle and the machine does the rest. Lapping compound is fed automatically and timer shuts off both machine and coolant flow at end of cycle. Inexperienced operators can be trained in minutes to supervise one or a complete battery, as needed.

Cut Finishing Costs, Now! This new 24″ production-type Lapping Machine provides a faster, more accurate method of generating true contact surfaces and low micro-inch finish. It is inexpensive to buy, features low-cost operation and maintenance.

Write for Bulletin MT-002 or contact your Taft-Peirce representative.

TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

CIRCLE 270 READER SERVICE CARD

time to re-examine

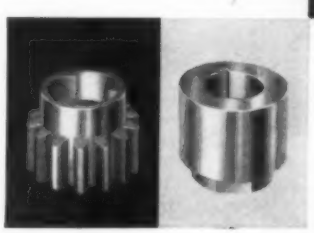
BEARING APPLICATIONS

Striking cost reductions in bearing applications in many mechanical products are made possible by the use of Bunting Sintered Powdered Metal Bearings and parts.

Bunting engineering counsel can guide you in the selection of designs and alloys that will provide bearings of exactly the type, design and material that will fully meet both cost and functional requirements, whether the material be Cast Bronze or Sintered Metal.

A competent group of Bunting Sales Engineers in the field and a soundly established Product Engineering Department put at your command, comprehensive data and facts based on wide experience in the designing and use of Cast Bronze and Sintered Powdered Metal Bearings and parts.

Write for catalogs and your copy of the new 24 page Bunting Engineering handbook of Sintered Powdered products and their composition, manufacture and application.



Bunting®

BUSHINGS, BEARINGS, BARS AND SPECIAL PARTS OF CAST BRONZE AND POWDERED METAL

The Bunting Brass and Bronze Company • Toledo 1, Ohio • Branches in Principal Cities

Field Report . . .

els of basic cutters and metoveyors which can form completely automatic units for integration into an automated extrusion line.

Controls Co of America Acquires Redmond Firms

Inventories, tooling, patents, and trademarks of Redmond Co, Owosso, Mich, and Redmond Motors, Ltd, St Thomas, Ontario, have been acquired (for about $1.7 million) by Controls Co, Schiller Park, Ill, maker of controls for a wide range of industries. The Redmond companies, with five US plants, produce electric motors and special types of electrical rotating equipment.

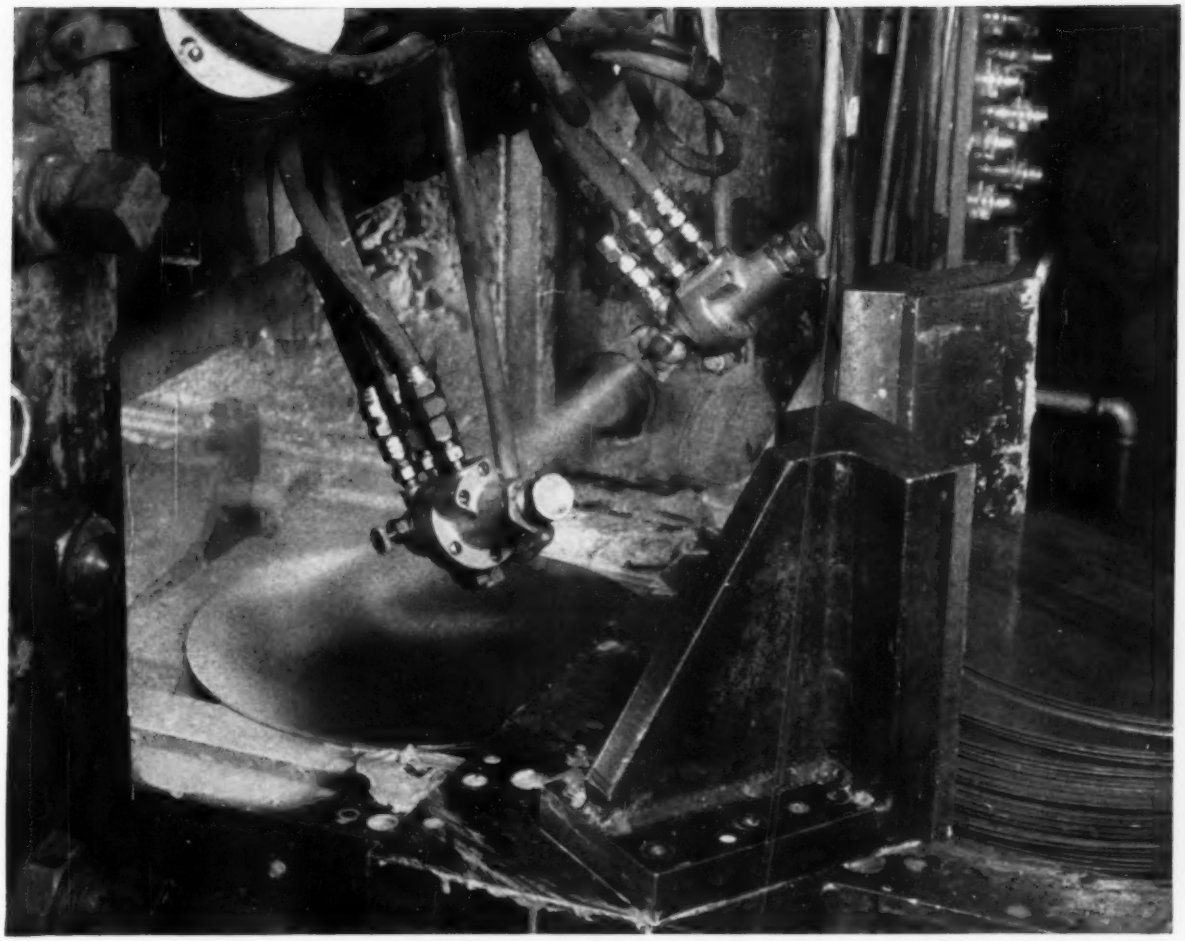
Sheffield Corp Offering Deep Hole Drilling Service

Contract drilling of small deep holes up to 44 in. deep, ranging in size from ⅛ to ½ in. dia is a new service offered to industry and government by Sheffield Corp, Dayton, Ohio. Work will be done on a deep hole drilling machine capable of performing close - tolerance drilling throughout its entire range.

Westinghouse Will Build . . .

. . . a multimillion-dollar power transformer plant on a 300-acre tract of land just south of Muncie, Ind. Production is scheduled to begin in late 1961; when normal operations are reached, plant will employ 2000 workers.

"I rotated it 45 degrees, like you said."



As an automatic feeding device slides another blank into the die, two DeVilbiss WDB Spray Guns apply a measured amount of lubricant—saving material, protecting dies, reducing rejects.

THESE SPRAY GUNS ARE SAVING $18,000 ANNUALLY!

"Applying die lubricants by the DeVilbiss Spray Method has cut our costs for compound, application, and press maintenance *in half*," reports the procurement engineer for one of the nation's largest refrigerator manufacturers. "What's more, malformed and broken parts have been practically eliminated.

"We are currently using the spray method on two 350-ton presses that form the housings for our rotary compressors. Originally, an extra man was required at each press to swab the compound by hand. We also tried dripping lubricant on rollers which transferred it to the stock. Both of these methods proved slow and wasteful with a high number of rejects.

"Now, by spraying the compound on the blanks automatically with two DeVilbiss WDB Guns, we get the *right* amount of lubricant in the *right* places. The result is a saving in material, fewer rejected parts, and fewer interruptions to remove 'breakouts' from the die. Downtime for press cleanup has also been substantially reduced."

If your manufacturing process involves the application of die lubricants, it will pay you to check the advantages of the DeVilbiss Spray Method. Call our nearest branch office for full details, or write: The DeVilbiss Company, Toledo 1, Ohio.

THE DEVILBISS COMPANY
Toledo 1, Ohio
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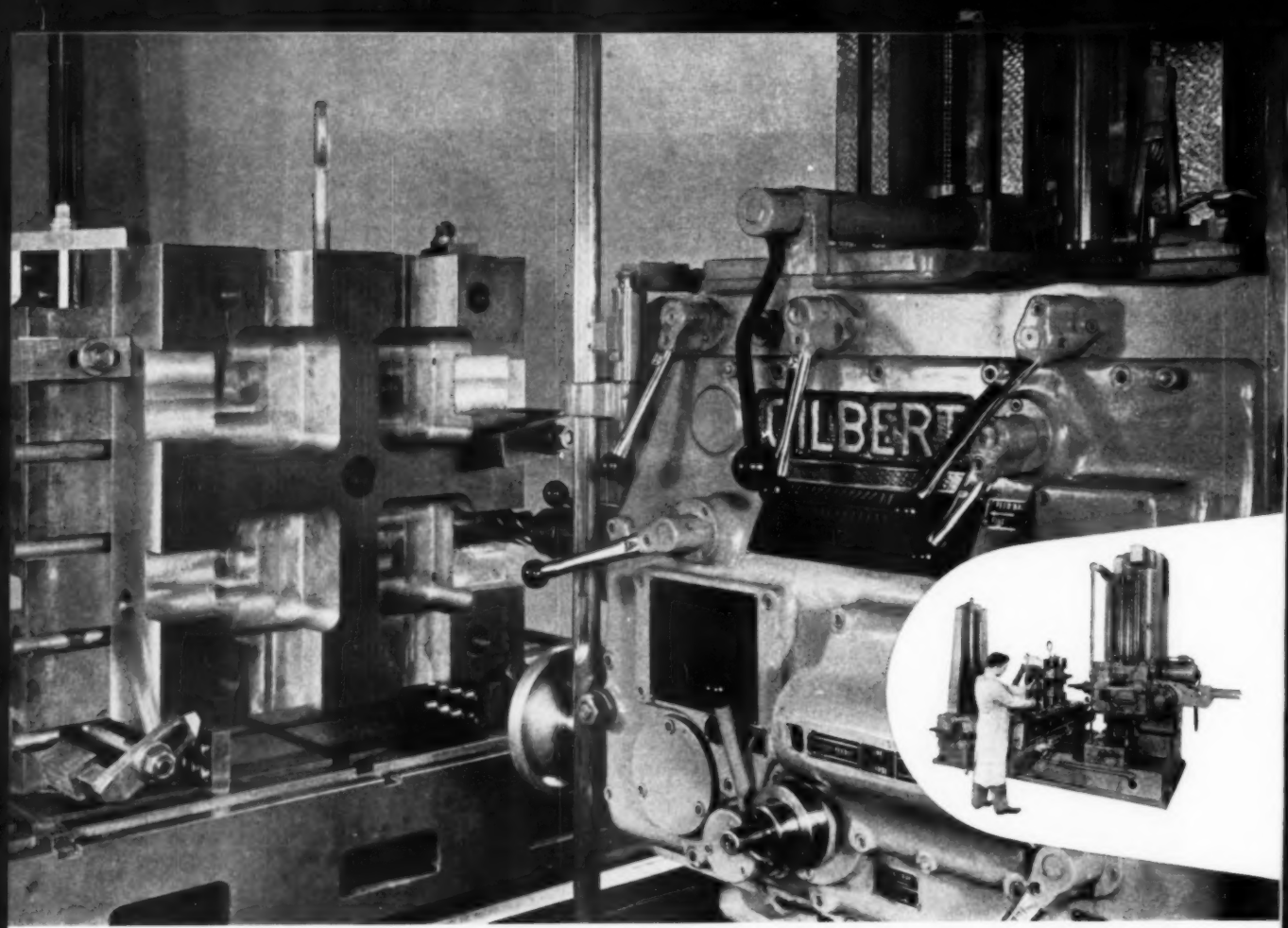
Branch Offices in Principal Cities

FOR BETTER SERVICE, BUY
DEVILBISS

CIRCLE 272 READER SERVICE CARD



courtesy Mohawk Tool & Die Corporation and Macaulay Machinery Co.

30 percent savings and ±.001"

...match it with a Gilbert

How's this for a perfect lineup: 30% savings in floor-to-floor time over previous machines, and ±.001" for mating the two chases of a four-cavity carburetor bowl mold.

Mohawk Tool & Die Corp., Rochester, N.Y., gets these savings and accuracy by handling the job on a Cincinnati Gilbert horizontal boring mill.

Here the lower chase (of hot work die steel) is being rough machined. Then it's hardened to a Rockwell of 48-50C scale. Finally, the chase is finish machined with carbide to an accuracy of ±.001" for guide pin and bushing holes, four cavity pockets, and eight slide ways.

Says Mr. George Neward, Mohawk's Secretary-Treasurer: "This job illustrates the flexibility of this type of machine. The ruggedness and stability of the Cincinnati Gilbert has been proven to us without doubt."

The comparatively low cost of adding these advantages to your operations will surprise you. Write for new literature, or—better yet—get a proposal from Gilbert now.

The Cincinnati Gilbert Machine Tool Co., 3340 Beekman Street, Cincinnati 23, Ohio

those who buy Gilbert buy **GILBERT** *again*

CIRCLE 273 READER SERVICE CARD

James Meehan (left), director of grinding machine sales for Brown & Sharpe Mfg Co's Machine Tool Division, has been appointed assistant to the general sales manager. **Alfred R Sparrow** (center), director of screw machine sales, takes over Mr Meehan's former post. **Duncan J Brown** has been promoted from supervisor to director of milling machine sales

NAMES IN THE NEWS...

J D Wright, president of Thompson Products, Cleveland, has been named board chairman and chief executive officer of Thompson Ramo Wooldridge Corp. Thompson and its affiliate, Ramo-Wooldridge Corp, Los Angeles, merged this month. **Dr Dean E Wooldridge** is president, and **Dr Simon Ramo** executive vice president of the new company. **Frederick C Crawford,** present board chairman of Thompson, will head the executive committee and serve as a special consultant.

William H Muchnic, president of the LFM Mfg Co, Atchison, Kansas, subsidiary of Rockwell Manufacturing Co, has been elected a vice president of the parent company.

B W Moreland has joined Copeland Refrigeration Corp, Sidney, Ohio, as general manager of manufacturing.

Walter W Appleton has been named director of screw machine sales for Brown & Sharpe Mfg Co's Machine Tool Division. He was formerly district sales manager for machines in Canada. **Ronald C Smith** has been appointed sales representative for machine tools in Canada. He was previously a machine tool salesman in the Mid-Atlantic territory.

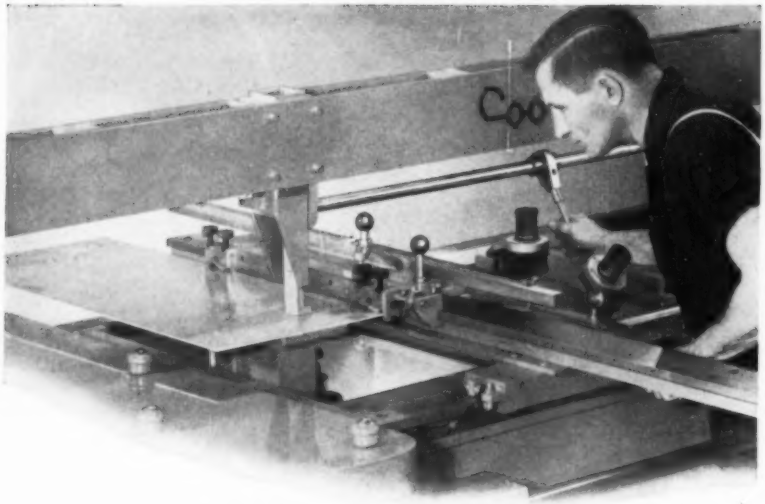
J R Dempsey has been named a vice president of the Convair Division of General Dynamics Corp. He will continue to serve as manager of Convair's Astronautics Division.

John W Scallan, vice president and general manager of Pullman-Standard Car Manufacturing Co, has been elected president to succeed **Charles W Bryan, Jr,** who will continue as a vice president of Pullman Inc, of which P-S is a subsidiary.

Col John N Dick, who has retired from the Air Force as chief, Manufacturing Methods Branch, Air Materiel Command, has joined Allegheny Ludlum Steel Corp, Pittsburgh. He will be assigned to the company's Washington, DC, office where he will be engaged in administrative and engineering liaison with government offices and industry concerned with advanced materials.

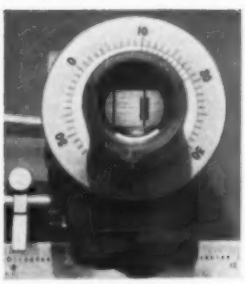
T C Coleman, president of Coleman Engineering Corp, Torrance, Calif, has been elected president and board chairman of Strategic Industries Association, national trade group of independent defense producers. Additional officers: **Harvey O Riggs,** International Electronics Engineering Corp, vice president; **E C Burkhart,** Genisco, Inc, vice president; **Don L Leavitt,** Airaterra Corp, treasurer; and **T D Caswell,** Air Logistics Corp, secretary.

Jack T Welch (left) has been appointed vice president in charge of field sales of Sheffield Corp; **William I Wilt** (center) has been named vice president, Gage and Instruments Division. Both men were previously assistant vice presidents of their respective divisions. **Victor J Boll** has been promoted from general manager to assistant vice president of the Contract Manufacturing Division

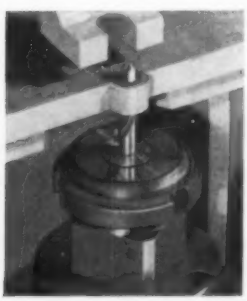


TEMPLATE MAKING

Made Easy



Dimensions are set to .0005-in. with optical scanner. Fine adjustment centers magnified scale graduation between reference marks for accurate locations.



Carbide bushing assures accurate drill orientation.

The WIEDEMANN COORDINATOR takes the high cost out of producing templates, drill jigs, simple fixtures and other precision work in flat sheet metal or plate. Holes are located and drilled to ±.002-in. with no accumulative error.

In rapid sequence, each hole is located to X and Y dimensions using optical scanners, and drilled from beneath the sheet through a carbide guide bushing.

With the new Wiedemann Coordinator, accurately drilled work is produced in a fraction of the time normally required. Time consuming manual layout is completely eliminated. Templates are produced on a machine specifically designed for template making—without interfering with work schedules on production equipment.

Get the facts about the

WIEDEMANN COORDINATOR

Write today for Bulletin C.

HICKS COORDINATOR DIVISION

WIEDEMANN MACHINE COMPANY

TURRET PUNCH PRESSES

AM-7 Gulph Road . . . King of Prussia, Pa.

NAMES IN THE NEWS...

Robert A Warfel has been appointed vice president and works manager of Nelco Tool Co, carbide manufacturing subsidiary of Brown & Sharpe Mfg Co's Cutting Tool Division. Mr Warfel was formerly superintendent of new product development for Nelco

Frank H Roby has been appointed an executive vice president of Federal Pacific Electric Co, Newark, NJ. Mr Roby was formerly vice president and director of the Square-D Co, Detroit.

Gordon R Walker, head of Walker Forge, Inc, Racine, Wis, has been elected president of Drop Forging Association. **Louis M Fehrenbach,** president and general manager of Indianapolis Drop Forging Co, Indianapolis, is new vice president.

J D Morris has been appointed manager of the new Utility Tractor and Equipment Sales Department of Allis-Chalmers Manufacturing Co

Douglas T McGinty, assistant to the president of Steel Improvements & Forge Co, Cleveland, has been named chief of the Forgings Branch of the Business and Defense Services Administration, US Dept of Commerce.

William A Baltzell, assistant sales manager, has been appointed industrial sales manager for Oakite Products, Inc, New York.

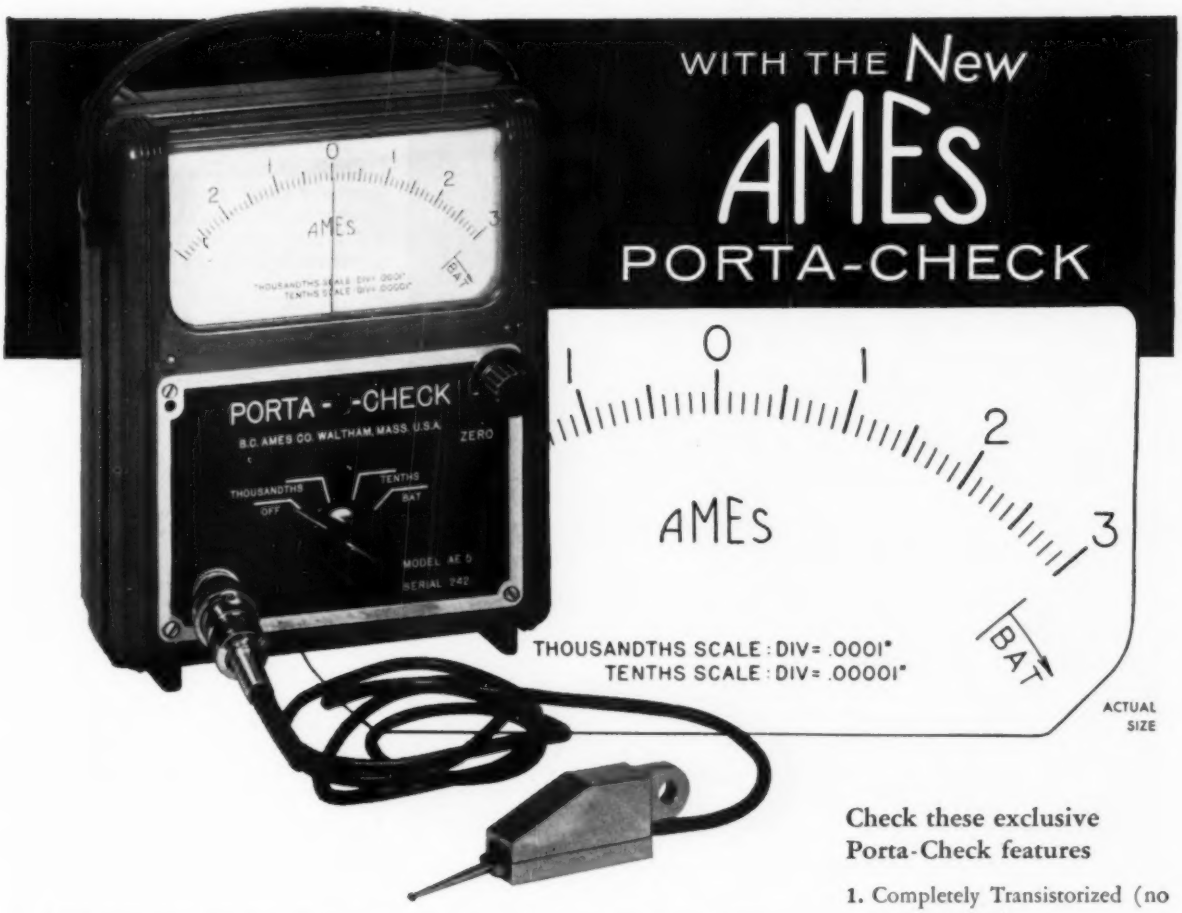
J P Gasser, has been named an executive vice president of Dresser Industries, Inc, Dallas, Texas. He was formerly executive vice president of Seaboard Oil Co.

Carl I Collins has been named vice president and assistant to the president of Copperweld Steel Co. He had been vice president of the Superior Steel Division of Copperweld at Carnegie, Penna. **Joseph W Kennedy, Jr,** formerly vice president of

Measure in Millionths

WITH THE *New*

AMES PORTA-CHECK



Now you can see ten millionths of an inch . . . Easily estimate five millionths . . . with Ames Portable Transistorized Comparator.

An amazingly sensitive comparator, Ames Porta-Check now makes it possible to get accurate measurements—*in millionths of an inch*—anywhere in the plant. Use it on the production line; at quality control check points; in the tool room—wherever you need it!

Porta-Check converts minute dimensional variations to voltage changes and amplifies them so they can be read easily and accurately. The meter dial—shown in actual size—can be used as either a "tenths" scale or a "thousandths" scale by simply setting the front panel rotary switch.

As a "tenths" scale it is graduated directly to *ten millionths*. With the generous spacing between graduations it is easy to estimate *five millionths*. Total range on this scale is .0006".

As a "thousandths" scale it is graduated directly to .0001", making it simple to estimate "half tenths". Total range on this scale is .006".

The low friction pick-up head is unaffected by environmental conditions and uses no mechanical magnifications. In fact, the pick-up tip, which is the only moving part in the pick-up head is supported by a blade fulcrum bearing that is frictionless and free from bind, play or wear.

Check these exclusive Porta-Check features

1. Completely Transistorized (no vacuum tubes)
2. Low cost, long life batteries provide power
3. Lightweight, portable—use it anywhere in the plant
4. Accurate, Sensitive, Rugged
5. Simultaneous zero setting for both scales
6. Simultaneous magnification setting for both scales
7. Two scales: "Tenth" scale graduated to *ten millionths*

   "Thousandths" scale graduated to .0001"

The new Ames Porta-Check is truly the most accurate portable comparator available today—and it's low in cost! See your local Ames representative or write directly to the factory for complete details.

Representatives in Principal Cities

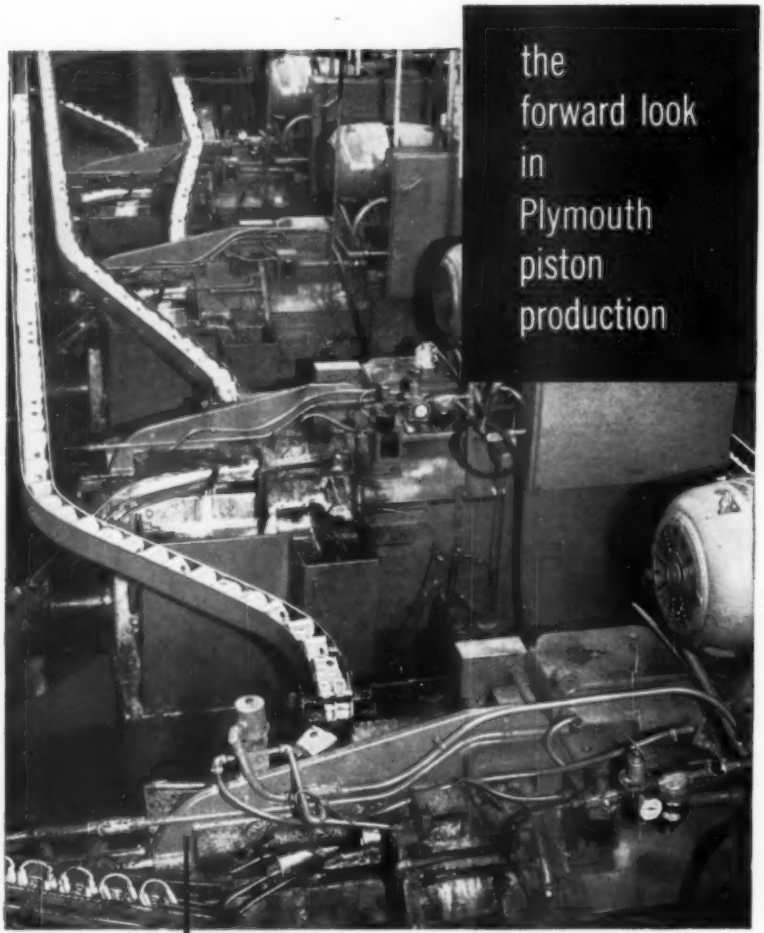
B.C. AMES CO.

26 Ames Street, Waltham 54, Mass.

Canadian Representative—J. B. Morrison Machinery Co., Ltd., 45 Ovide Parkway, Toronto

MANUFACTURERS OF MICROMETER DIAL INDICATORS AND GAUGES

CIRCLE 275 READER SERVICE CARD 141



Features BAIRD

COMPLETELY AUTOMATIC
HIGH PRECISION
CHUCKERS

Four Baird Model 76H Automatic Chuckers, at Chrysler Corporation's Mound Road Engine Plant, handle *all* Plymouth pistons on this new mechanized production line.
They rough and finish two cuts on the O. D.; rough and finish ring grooves; rough and finish two cuts on the dome; chamfer skirt and dome; face to length. With auto load and unload, aluminum pistons are finished in 8 seconds.
Chrysler Corporation is a long-time Baird chucker customer. Chrysler engineers know that Bairds meet the requirements in machining speed . . . in close tolerance quality of work produced . . . and in freedom from down-time.
If you can use the exceptional capacity and low-cost productivity of Baird 6-spindle and 8-spindle chuckers, write Dept. AM for more information.

THE BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

BAIRD

NAMES IN THE NEWS...

the Ohio Seamless Tube Div at Shelby, takes over Mr Collins' post, and **Reid M Pittenger**, manager of industrial relations, succeeds Mr Kennedy.

J A O'Grady, president of Weldaloy Products Co, Van Dyke, Mich, has been elected president of the Resistance Welding Alloy Association. **J C Cox**, president of S-M-S Corp, Detroit, has been elected vice president.

Gregory M McKeown has been named to the new post of branch operations manager of the Machinery Hydraulics Division of Vickers Inc. He was formerly manager, Customer Services.

Bernard T Brennan has been elected president and chief executive officer of Anti-Corrosive Metal Products Co, Castleton-on-Hudson, New York. He was previously president of Chisholm, Boyd & White Co, heavy machinery manufacturer of Chicago.

Wayne Thompson has joined Horkey-Moore Associates, Torrance, Calif, as assistant to the vice president, manufacturing. He was formerly test supervisor for Torrance Engineering Co.

Robert B Meneilly has been named manager of tin plate products for US Steel Corp. Formerly assistant manager, tin plate sales, he succeeds **J C Whetzel** who has retired.

John M S Hutchinson has joined Bendix Aviation Corp as staff assistant to the president on manufacturing activities. He was formerly vice president, assistant to the president, and a director of Perkin-Elmer Co.

Jay D Sherman, former district manager of the Reed Prentice branch office in New York, has been promoted to field sales manager of the Reed-Prentice Division of Package Machinery Co, East Longmeadow, Mass.

OBITUARIES

Joseph H Flavell, 66, president and treasurer of W O Barnes Co, Detroit manufacturer of metal cutting saw blades, died June 13. Mr Flavell was a co-founder of the company.

Melvin Emrick, 48, board chairman of the Ettco Tool & Machine Co, Brooklyn, died June 30.

SHE RIDES ON AIR for less because of

-Verson- TRANSMAT FORMING

In the battle to give the consumer as much for his money as possible, leading manufacturers have found Verson Transmat Forming to be a major weapon. Whether you make automotive air suspension reservoirs such as are produced on the press shown below or refrigerator trays or door tracks or any stamping in quantity, investigate the cost cutting advantages of Verson Transmat Forming. Do it, today; write or phone.

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9316 S. Kenwood Ave., Chicago 19, Illinois
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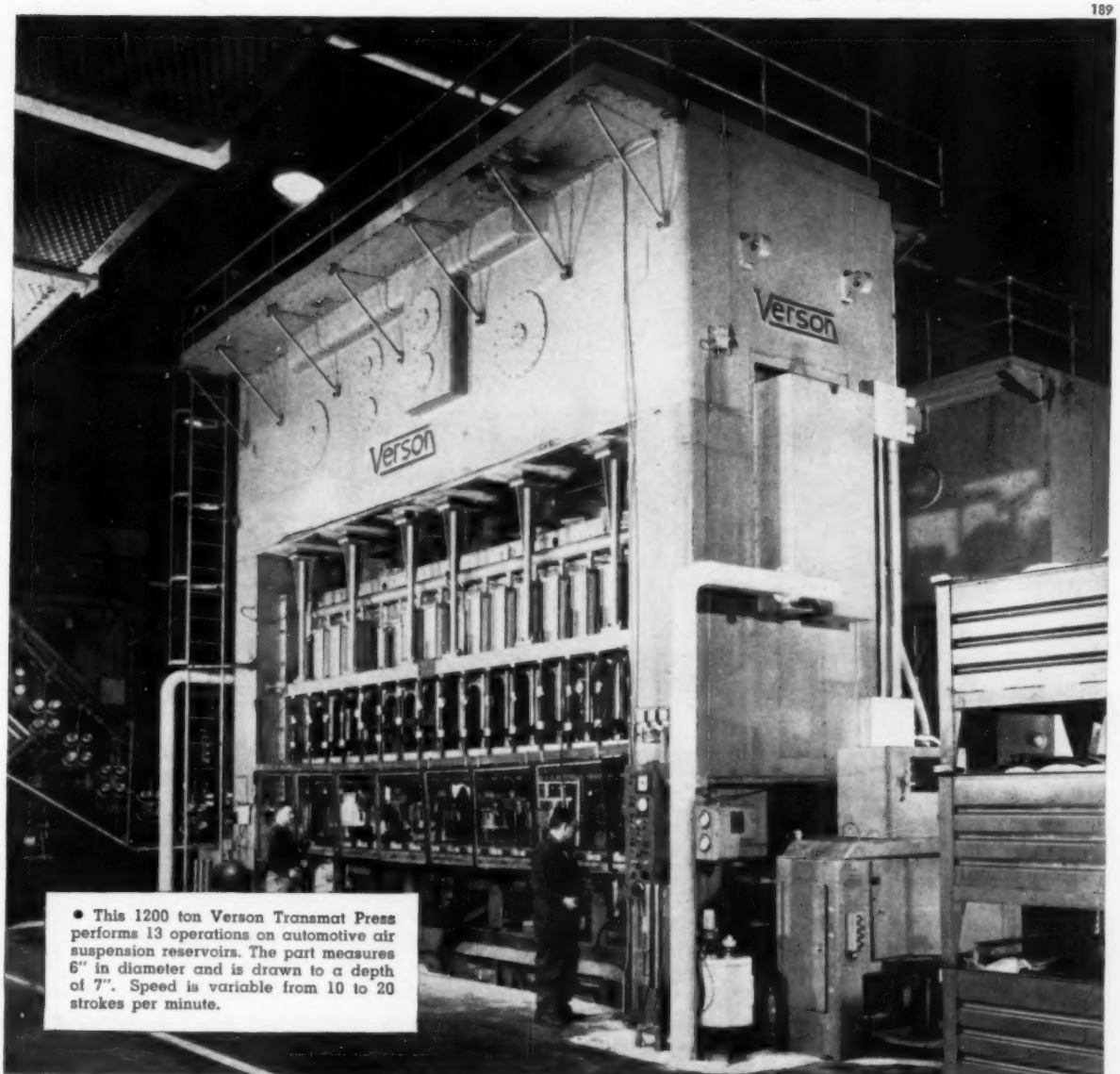
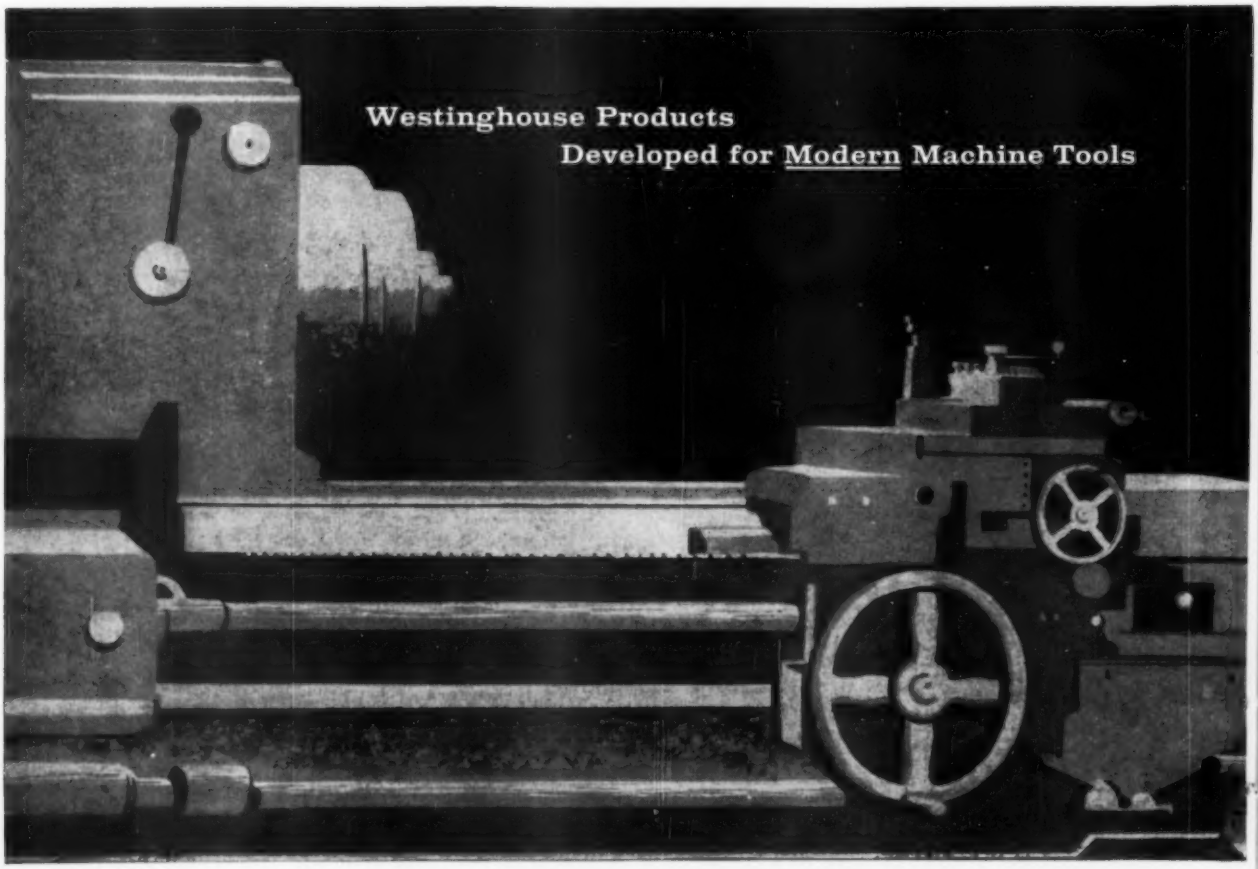
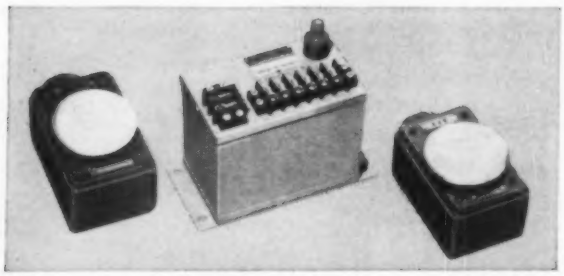


• This 1200 ton Verson Transmat Press performs 13 operations on automotive air suspension reservoirs. The part measures 6" in diameter and is drawn to a depth of 7". Speed is variable from 10 to 20 strokes per minute.

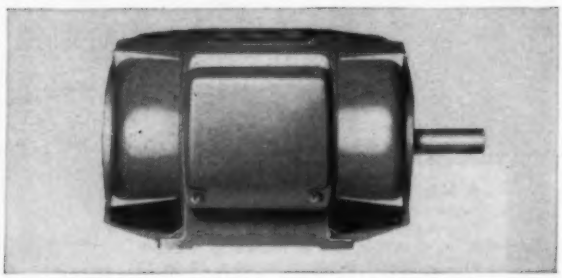
MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

NEW NULTRAX ACCURATE TO





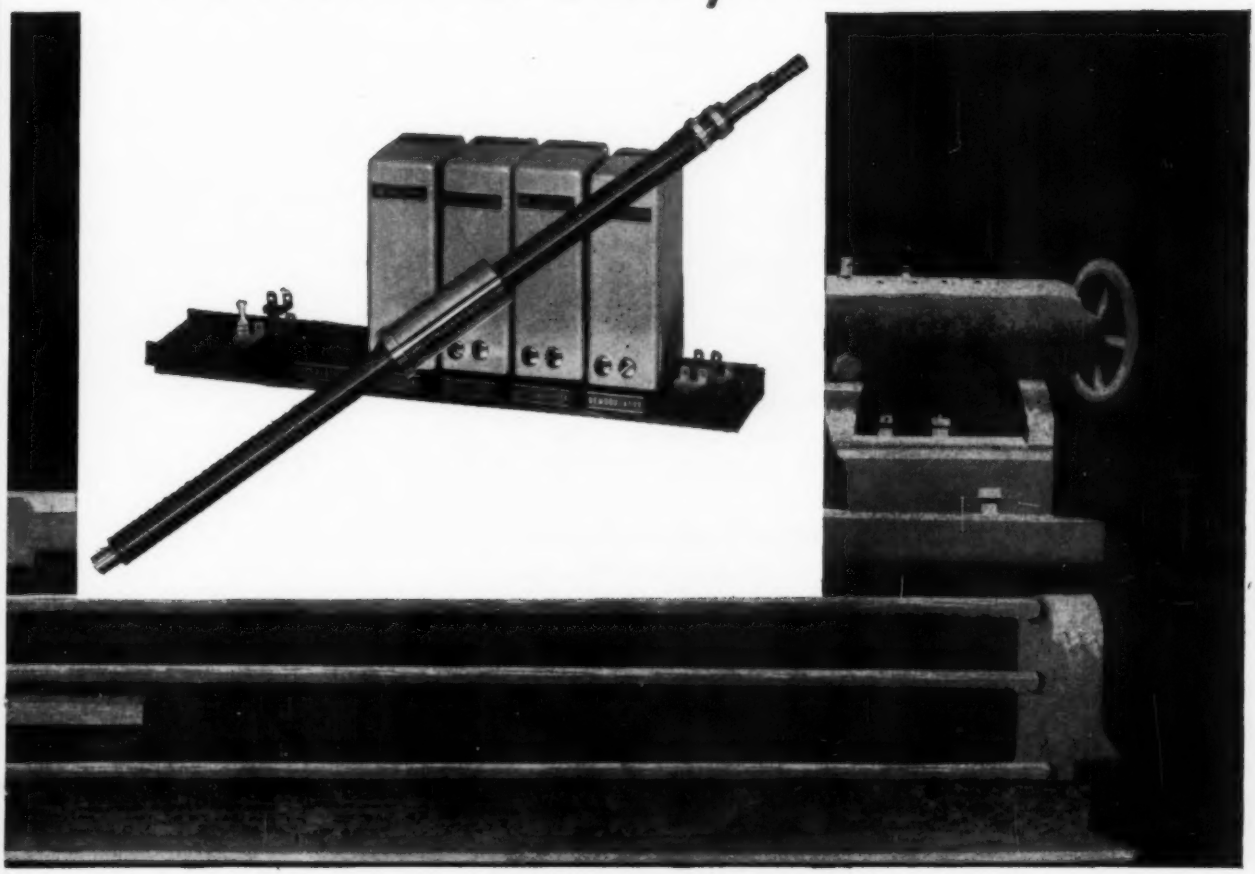
***New Westinghouse Cypak*®** Dual Safety Interlock is a highly reliable, anti-repeat safety device for punch press operation—completely static; no moving parts, contacts or tubes to wear or burn out.



***Westinghouse Life-Line*®** "*A*" a-c motor, the industry standard, combines Bondar®, Bondite and Mylar* insulation for long life. Prelubricated, factory sealed bearings eliminate need for lubrication—keep lubricants in, dirt out.

*Du Pont registered trademark

WESTINGHOUSE CONTROL 1 PART IN 100,000



Unaffected by wear and free from backlash, NULTRAX linear positioning system makes possible the measurement of linear displacement on one or more axes to accuracies of one hundred thousandth of its full range of travel, which may extend over distances of many feet. NULTRAX and other Westinghouse numerical control systems are available to cover the complete range of production accuracies.

Positioning systems are another example of Westinghouse products—the sign of a modern machine tool designed to give the most production at the lowest possible cost. A coordinated electrical system, designed and supplied by Westinghouse industry-experienced engineers, is sure to give the best in long-term economical service.

For complete information about NULTRAX and other Westinghouse POWER-UP products for modern machine tools, ask your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-96112

YOU CAN BE **SURE**...IF IT'S

Westinghouse

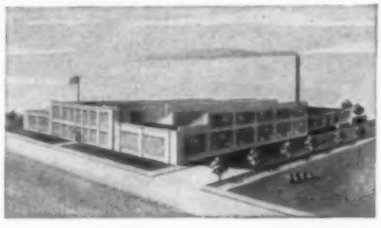
Here's how CDT can help you

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



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ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

NEW BOOKS...

MECHANICAL WORLD ELECTRICAL YEAR BOOK (1958). *Published by Emmott & Co, Ltd, 31 King St West, Manchester 3, England. 359 pages, 4 x 6. Price 3/6 (50¢).*

Now in its 51st year, this standard British publication contains a great deal of information and tables of interest to electrical engineers. In this new edition, the section on electronic devices has been considerably expanded to include additional information on amplifiers, time-delay circuits, gas-filled tubes, motor controls, and oscillators.

•

GRAPHIC SCIENCE—*By Thomas E French and Charles J Vierck, professor of engineering drawing, Ohio State University. Published by McGraw-Hill Book Co, 330 W 42nd St, NY 36. 758 pages. Price $8.50.*

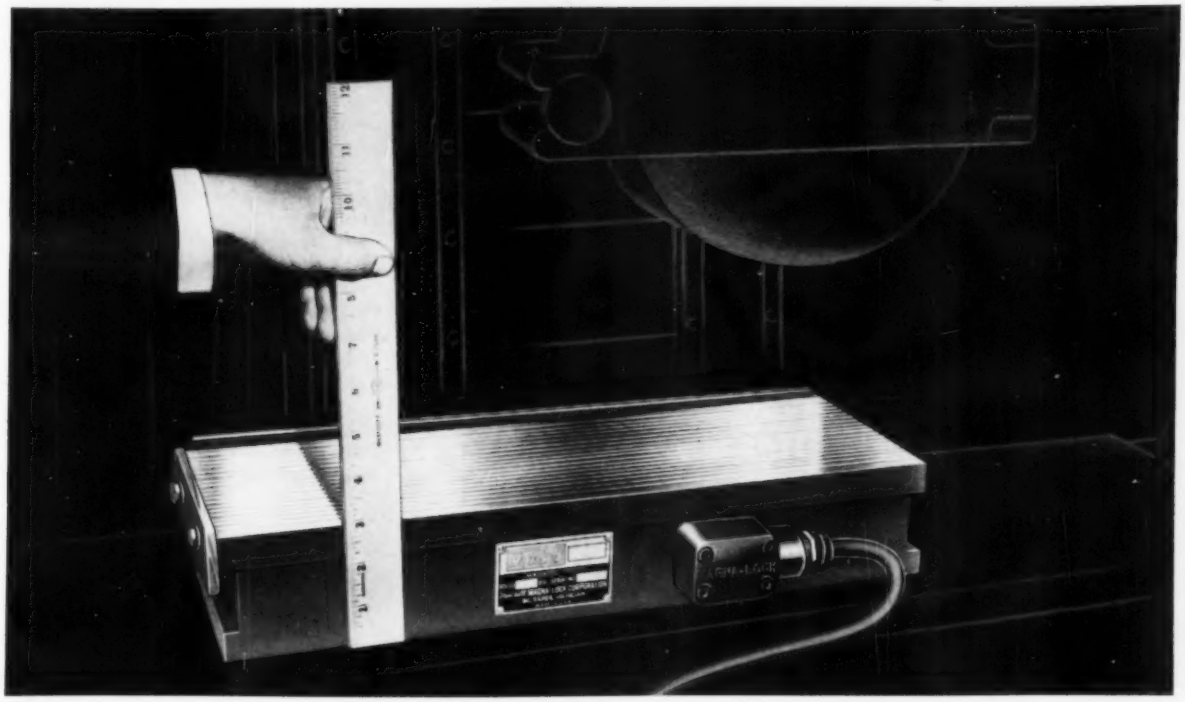
There have been eight editions of *Engineering Drawing* by French and Vierck, the latest in 1953, and these will presumably continue. *Engineering Drawing* is an excellent and constantly improving basic text for engineering students. On this base the author (Mr Vierck did the work; Mr French is deceased) has built a new book of broader scope and much improved appearance.

Graphic Science includes most of the solid basic material of *Engineering Drawing*, but with revisions and reorganization. To this well-established material has been added sections on descriptive geometry and graphic solutions. Thus, the new book is a complete text and reference work on engineering graphics.

Graphic Science is more than a good text; it is an attractive book with top-notch illustrating material, including photos as chapter headpieces—they add an important element of texture to help students relate their drawing-board work to the actual parts and machine elements they have in mind. Many of the established *Engineering Drawing* illustrations are included through the new book, but the weak sisters have been dropped, new photos and sketches added, and the whole effect is of much improved illustration.

Text has been revised, too. The chapter on instruments has been sharply edited down to a sensible size, and sections on tools, machine elements, and architecture have been

Need more machine work space?



This chuck gives you 28% more capacity

If capacity of your present machines is hampering production efficiency, put Magna-Lock Model CL Electromagnetic Chucks on those machines and gain 28% more working height under grinding wheels and cutting tools.

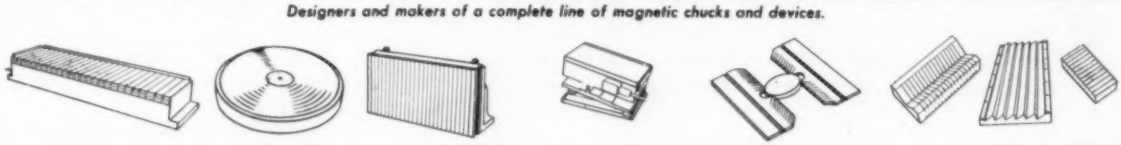
Model CL combines the advantages of famous Magna-Lock holding power and fast, easy loading and unloading with a *low 2-7/8 inch overall height*. This rugged all-welded steel chuck saves time and money on grinding, milling, welding, drilling, sawing and many other operations. Model CL is available in seven sizes, from 5" x 10" to 10" x 16" working surfaces.

Send today for full details and the name of your nearest Magna-Lock dealer. Write or 'phone Dept. A-78.

Hanchett MAGNA-LOCK CORPORATION

BIG RAPIDS, MICHIGAN, U.S.A. P. O. Box 816 Telephone 815

Designers and makers of a complete line of magnetic chucks and devices.



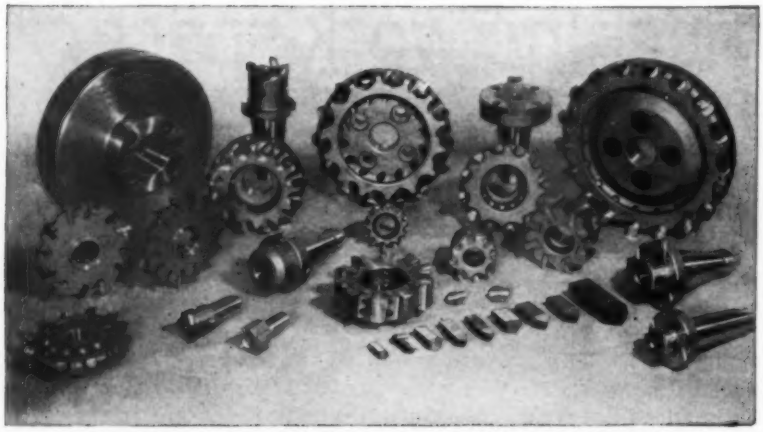
Rectangular, rotary, vertical face, swiveling and angular elevation electrical chucks and permanent magnet chucks

Electrical and permanent magnet sine chucks

Magna-Vise permits magnetic chucks to hold non-magnetic materials

Parallels, V- blocks and top plates

48-hour repair service—electrical and permanent magnet chucks—any make.



Milling Cutters — End Mills — Blades — Boring Tools — Arbors — Flywheels

These Lovejoy Products can help you Cut Costs!

The entire line of Lovejoy Milling Cutters and Accessories is designed to aid you in getting better production at less cost.

If you are not now using Lovejoy products, we invite you to do so at first opportunity.

Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

Blades: H.S.S., Vasco Supreme and carbide. These are interchangeable over a wide range of housing sizes, and Type "A" face milling blades will fit any standard Lovejoy Type "A" cutter of 4½" to 24" dia. All Lovejoy blades are carried in stock, ready for immediate shipment. Special cutters are a Lovejoy specialty.

PERFORMANCE REPORT

A Type H "SHEARJOY" cutter (with 35° lead angle) was used recently to reduce a 11,070 lb. casting to 3400 lbs. The cutter ran 18 straight hours without regrinding. Cutter condition after using was excellent. Owner's comment: "This is the cutter I've been looking for for a long time . . . if we had this cutter 10 years ago, we would have saved $50,000 . . . it's the most impressive cutter I have ever seen."

Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U.S.A.

dropped because they were too specific for a general text.

Additions include descriptive geometry, vectors, solution of graphic problems, scales, nomographs, empirical equations, and graphic calculus—making the book more basic and complete for all branches of engineering without favoring any particular segment.

In effect, *Graphic Science* is a practically new book based on an old, well-established best seller that has become standard in schools and on reference shelves. It is a book of much more commanding appearance than *Engineering Drawing*, and much easier to plod through, but it is still a solid fundamental work that should gain high acceptance.

For an engineer it is fun to look at and easy to read. It should also make the lives as well as the education of students a bit easier.

•

ASME HANDBOOK—METALS ENGINEERING PROCESSES—*Edited by Roger W Bolz, editor, Automation. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36. 448 pages, 7x10. Price $13.50.*

The final volume of the four in the ASME handbook undertakes to cover all the metalworking processes. The earlier three volumes deal with metals properties, product design, and engineering tables.

The book contains a great deal of standard information and it is well organized. It is surprising to find no information on the heat treatment of nonferrous metals, though there is a section on steel that does an excellent job of summarizing this subject.

Sections dealing with hot and cold working are probably the most detailed and complete in the volume. Casting, powder metallurgy, welding and cutting, finishing, and electroforming are also well covered by sections.

However, the whole field of machining is covered in one section of 22 pages. While a great deal of information is packed into this, it is impossible to handle so complex a subject adequately in so limited a space. The result is that many special situations cannot be covered. For example, in grinding there is no indication that for certain materials it is desirable to reduce the wheel spindle speed.

Despite such defects, the handbook contains much valuable information and can be recommended as a basic reference for metalworking processes.

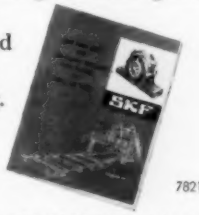
This man is tabling downtime indefinitely with SKF's new steel pillow blocks

He's cutting bearing maintenance to a minimum yet drastically reducing the chances of table downtime! For he's equipping the mill tables with SKF's new SMT Steel Pillow Blocks with self-aligning spherical roller bearings.

The split construction design of these new pillow blocks makes it possible for rolls to be removed without disturbing base alignment. The non-rubbing, labyrinth-type seal effectively keeps out scale and water and is not affected by high temperatures.

The Type "C" Spherical Roller Bearing gives him the highest capacity available in any self-aligning roller bearing. This high capacity is available despite angular misalignment caused by heat warpage of the table structure or other factors promoting table misalignment.

He'll save with direct, center lubrication, too . . . because a lubricating groove is provided around the circumference of the outer ring of SKF sphericals with equally spaced holes drilled in the ring connecting the groove to the center of the bearing. Grease moves around the groove and through the holes which channel it directly to the center of the bearing.



Why not make the change-over to SKF Steel Pillow Blocks yourself? Write for Catalog #447.

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Spherical, Cylindrical, Ball, and "Tyson" Tapered Roller Bearings

EVERY TYPE—EVERY USE

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we took the puzzle out of jig boring

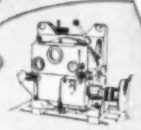
with the

DIXI 60

horizontal optical jig borer

(Made in Switzerland. Measurements in Inches)

The only horizontal jig borer that combines the accuracy of the vertical spindle with the versatility of the horizontal spindle.



DIXI 450 Optical Precision Rotary Table

ACCURACY: Optical settings provide an overall accuracy of .0002".

VERSATILITY: The combination of the Dixi 60 and the Dixi 450 precision optical rotary table (illus.) permits jig-less boring, facing, milling and drilling work in all planes and compound angles between them with optical interrelationship all in one set-up.

PRODUCTIVITY: A complete optical setting including unclamping, positioning, fine adjustment, reclamping and rechecking takes less than 10 seconds. Convenient and functional controls eliminate idle machine time.

The DIXI Optional Reversing Process assures perfect alignment in work pieces with line bores, as well as round, taper-free holes. Get all details on this process by writing for illustrated catalog.

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York.— Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the Dixi 60.

MBI

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A DIVISION OF MACHINERY BUILDERS, INC.

475 Grand Concourse, Bronx 51, N. Y.

"Over 25 years' experience in designing and building machinery"

NEW FILMS . . .

MORE THAN JUST STEEL. *Produced by Armco Steel Corp, Middletown, Ohio. 16 mm, sound, color. Running time 30 min.*

The story of special-purpose sheet steels, from electrical steel and enameling iron in the early years of the century, to the special zinc-coated and aluminum-coated steels of today, is told in colorful fashion in this new film. Also covered are standard and special stainless steels, their development and interesting uses.

•

KEY TO MACHINING VERSATILITY. *Produced by The Bullard Co, Bridgeport 9, Conn. 16 mm, sound, color. Running time 14 min. No charge.*

The versatility of the Bullard Hydra-Feed lathe, both as a tracer and as a multiple-tool machine, is clearly demonstrated in animation and live film on a wide variety of parts.

•

FORMING FOR UNIFORMITY. *Produced by Carpenter Steel Co, Alloy Tube Div, Union, NJ. 16 mm, sound, color. Running time 30 min. No charge.*

The entire process of producing uniform welded stainless pipe and tube is covered in this new picture. It starts with the melting and refining of raw materials, continues with hot and cold rolling of strip, and shows welding, annealing, cleaning, testing, analyzing, labeling, and packaging of the finished product. Considerable stress is placed on destructive and nondestructive testing, including visual inspection, ultrasonic and acid-etch, flattening, bending, stressing and flaring, X-ray, Borescope, and corrosion testing.

•

AUTOMATION AND MR. HALSTEAD. *Produced by General Electric Co, 1 River Road, Schenectady 5, NY. 16 mm, sound, color. Running time 30 min. No charge.*

This film, and the accompanying 44-page manual, forms the second part of GE's two-part program, "Automating Electrically." The first part, "This is Automation," was released in 1956.

The new program dramatizes the need for keeping abreast of develop-

ALMCO BARREL FINISHING CUTS DEBURRING TIME 75% ON JET PARTS!

TWO GIANT ALMCO MACHINES cut deburring time 75% on turbojet engine parts made by a large aircraft engine components manufacturer.

In just 2½ hours, a barrel load of 14 jet vane and shroud assemblies is descaled, ground, deburred, cleaned and rust-inhibited. A custom-made fixture holds these assemblies rigid and stationary as two tons of abrasive media smooths every surface and crevice of the intricate parts!

These rugged Almco machines eliminate hand deburring, vapor blasting and wash operations. There is less chance of damage to components . . . better mating of parts in the completed engine . . . better balance . . . increased part life.

WHETHER YOU NEED a large special machine like the one shown or a smaller Almco barrel finishing unit, you can get expert advice without obligation. Write on company letterhead asking for an Almco engineer to call. Or send sample parts with specifications on results desired. You will get a prompt, factual report from the Almco lab.

SEND FOR THIS NEW BARREL FINISHING HANDBOOK

Complete description of the most advanced modern processes. 52 pages of facts, photos, data and cost comparison charts. Write for your copy.

ALMCO

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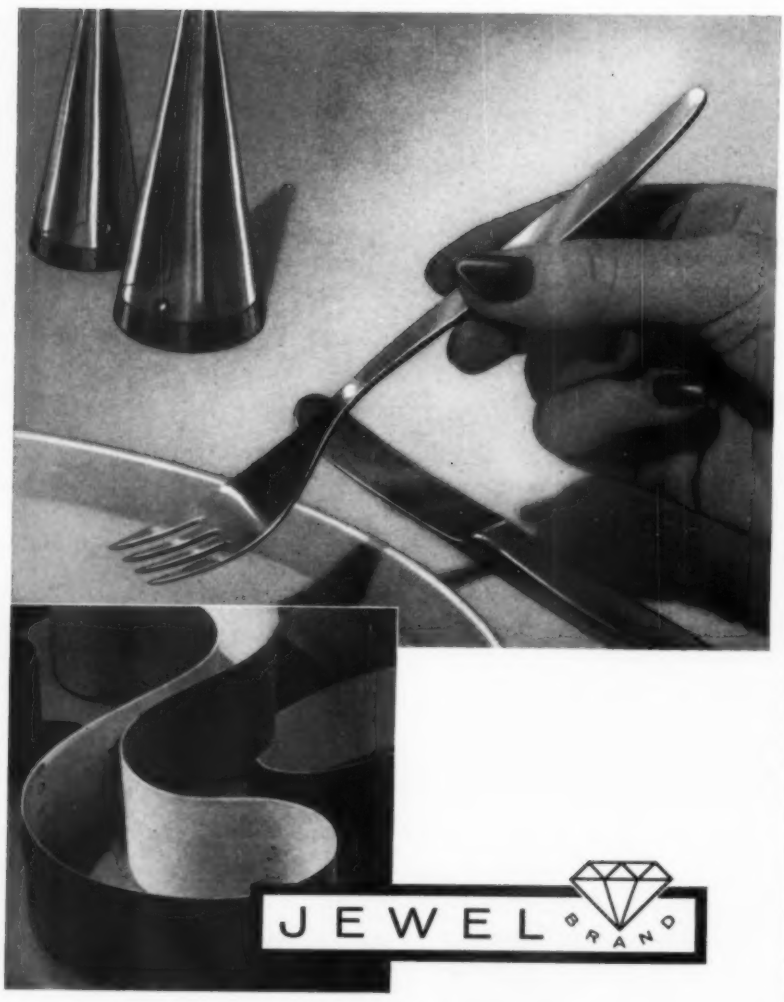
Subsidiary of KING-SEELEY Corporation
Sales Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven and Philadelphia
IN ENGLAND: *Almco Division of Great Britain Ltd., Hitchins, Herts, England*

For the finishing touch that means so much!

From the smooth feel of perfectly polished stainless steel tableware to the contoured grips on modern power tools, Jewel Brand Coated Abrasives are bringing fast, efficient grinding, smoothing and polishing to the manufacture of hundreds of products. Because *end products cost less when you finish with Jewel Brand Abrasives*, it will pay you to bring their many advantages to bear on your finishing problems. Order now from your Industrial Distributor or write for specific recommendations.



COATED ABRASIVES

Belts • Rolls • Sheets • Discs • Specialties

ABRASIVE PRODUCTS, INC.

South Braintree 85, Massachusetts

ments in electrical technology, and a major point made in both film and manual is the building of flexibility into automated processes. The manual is entitled "The Impact of Electrical Progress on Your Automation Planning," and it outlines recent electrical developments in power converting, data storing, programming, computing, and communicating.

Examples of automation presented in the film include descriptions of a new program-controlled milling machine which achieves profitable automation on runs of only two identical pieces, and of an automatic warehousing installation controlled by static switches which have no moving parts.

•

SMALL BUSINESS USA—THE STORY OF MAIN STREET. *Produced by Dun & Bradstreet. 16 mm, sound, black & white. Running time 30 min. Available from Ideal Pictures Inc, 58 East South Water St, Chicago 1, Ill. Rental fee $2.75.*

Is there a formula for success in business? Why can one man make a success out of a business in which the former owner failed? This is the basic theme behind the story of a number of small businesses as seen through the eyes of an accountant. The story is told in episodic form by visits to, and conferences with, the owners of small stores along the main street of a fictional town. Assisted by a lawyer, a banker, and a Dun & Bradstreet reporter, the accountant shows the different situations behind each store front, illustrates the problems faced, tells how they are surmounted, and what happens when they are not.

•

PUNCH PRESS GUARDING. *Produced by Industrial Accident Prevention Ass'ns of Ontario. Available from International Film Bureau, Inc, 57 E Jackson Blvd, Chicago 4, Ill. 16 mm, sound, color. Running time 11 min. Price $115.*

Punch presses have the unenviable record of producing a higher percentage of permanent-disability accidents than any other type of equipment used in manufacturing, and some shocking examples of these are shown in this new film. It then shows the various guards that are available, the types of operations for which they are best suited, and

WILSON "ROCKWELL"

HARDNESS TESTERS

WORLD'S STANDARD OF ACCURACY

ACCO for Better Values

EQUIPMENT for EVERY Hardness Testing Requirement

No matter what your hardness testing requirements are, there's a WILSON "ROCKWELL" instrument to do the job. Choose from this complete selection of hardness testers:

"ROCKWELL"—for most hardness testing functions.

Superficial—for extremely shallow indentations.

Twintester—combines functions of "ROCKWELL" and "ROCKWELL" Superficial testers.

Semi-Automatic (manual feed) and Fully Automatic—for automatically classifying tested pieces as CORRECT, TOO HARD, or TOO SOFT—at test rates up to 1000 pieces per hour.

Special Machines—for testing large objects, obtaining internal readings, and other unusual applications.

ALL WILSON "ROCKWELL" hardness testers provide these advantages:

Accurate performance—precision built, with exact calibration, for consistently correct results.

Long life—durable as a machine tool.

Easy operation—even an unskilled operator can get perfect readings. All controls conveniently grouped.

Easy maintenance—interchangeable mechanisms, with spindles mounted on oil-less bearings.

DIAMOND "BRALE" PENETRATORS

for perfect testing every time

A perfect diamond penetrator is essential to accurate hardness testing. Since one point of hardness on the "ROCKWELL" scale represents only 80 millionths of an inch of penetration—only 40 millionths on a Superficial tester—the slightest imperfection will cause a false reading.

Only *perfect* Wilson Diamond Brale Penetrators are sold. Each diamond is flawless, with no chips or cracks. It's cut to an exact shape. Microscopic inspection and a comparator check of every diamond—one at a time—assure this perfection—and assure you of accurate hardness testing every time.

A COMPLETE LIBRARY of Helpful Information

A wide variety of bulletins tells about hardness testing, and describes the many instruments, accessories, and services Wilson offers. Write for your choice:

DH-325—WILSON "ROCKWELL" Hardness Testers • **DH-326**—"ROCKWELL" Superficial Hardness Testers • **TT-58**—"ROCKWELL" Twintester • **DH-327**—Special "ROCKWELL" Testers, including Automatic and Semi-Automatic models • **DH-328**—TUKON Tester, for precision MICRO and MACRO testing

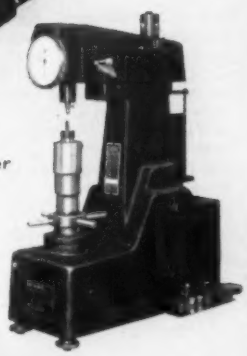
ACCO **WILSON**

MECHANICAL INSTRUMENT DIVISION

AMERICAN CHAIN & CABLE

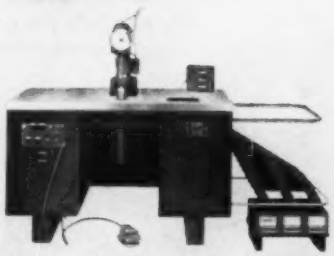
Park Avenue, New York 17, N.Y.

"ROCKWELL"



Twintester

Superficial



Automatic

TUKON Tester (for MICRO and MACRO testing)

FRICTION SAWING with...

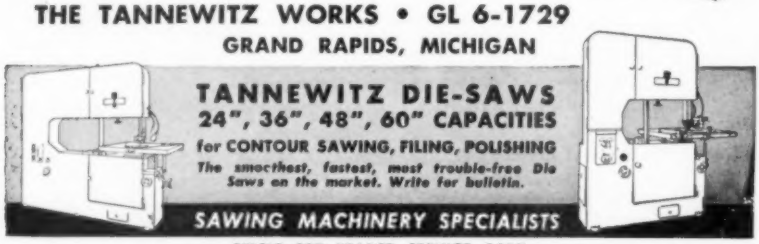
Tannewitz
HIGH SPEED BAND SAWS

SOLVES THOUSANDS OF PROBLEMS!

FOR EXAMPLE: cutting side panels of a barometric damper as shown above. Cost of dies required for seven sizes would have approximated $12,000 — a prohibitive sum for volume required on these sizes. Friction-sawn on a TANNEWITZ High Speed Band Saw in multiples of two in 1.2 minutes each — a very moderate cost which makes feasible the complete line required. Cost of machine was only a small fraction of cost of dies contemplated and it is also available for many other uses.

For trimming castings, formed parts, cutting metal as hard as a file and dozens of other operations, too, friction sawing with TANNEWITZ High Speed Band Saws offers tremendous advantages. Write for free booklet, "FRICTION SAWING."

THE TANNEWITZ WORKS • GL 6-1729
GRAND RAPIDS, MICHIGAN



TANNEWITZ DIE-SAWS
24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Die Saws on the market. Write for bulletin.

SAWING MACHINERY SPECIALISTS

CIRCLE 287 READER SERVICE CARD

MORE HEAT TREATING VOLUME
with BASIC "BUZZER PACKAGE"

NO BLOWER OR OTHER POWER NEEDED
. . . just connect to gas supply

"BUZZER" modern gas-fired heat treating and melting units give you the most dependable, economical and productive system for turning out quality jobs at low productions costs. *When power is off — "BUZZER" stays on the job!* Standard and special furnaces, large or small, available to equip your shop to exact requirements.

COMPLETE LINE OF BUZZER REG. U.S. PAT. OFFICE BURNERS FOR CLEANING, RINSING, PICKLING AND SUNDRY HEAT OPERATIONS

WRITE TODAY FOR NEW "BUZZER" CATALOG

CHARLES A. HONES, INC.
121 S. GRAND AVENUE, BALDWIN, L.I., N.Y. • BAldwin 3-1110
HEAT TREATING EQUIPMENT SPECIALISTS SINCE 1911

the proper setup for each. The important part the setup man plays in providing safe operation is stressed, and it is pointed out that no guard can provide adequate protection unless it is properly adjusted.

Various types of presses are shown, with examples of the work performed on each, the setups required for safe operation, and the adjustments that can be made. The purpose of the film is to show management and employees that guards are available for almost any type of press operation or material to be fed.

•

SWAGING. *Produced by Bray Studios Inc, 729 Seventh Ave, New York 19, NY. 16 mm, sound, black & white. Running time 21 min. No charge.*

The principle involved in the operation of a swaging machine is described in detail, together with examples of the many types of metal work that can be formed. Animated technical diagrams are used to describe the operating parts. Work covered includes pointing, forming, and fitting of attachments by swaging. Incorporated into the film is the U S Office of Education film, "Swaging Cable Terminals."

•

A PRODUCTION CUT-OFF BAND SAW. *Produced by DoAll Company, Des Plaines, Ill. 16 mm, sound, color. Running time 10 min. No charge.*

How cost-cutting methods are applied to basic cutoff operations by using a 2-in. wide high-speed steel saw band to cut large billets, rails, and structurals is the theme of this new film. Shots show the cutting of various alloys and give cutting rates and other pertinent data. Shown also, are the simplified controls and their function for smooth operation.

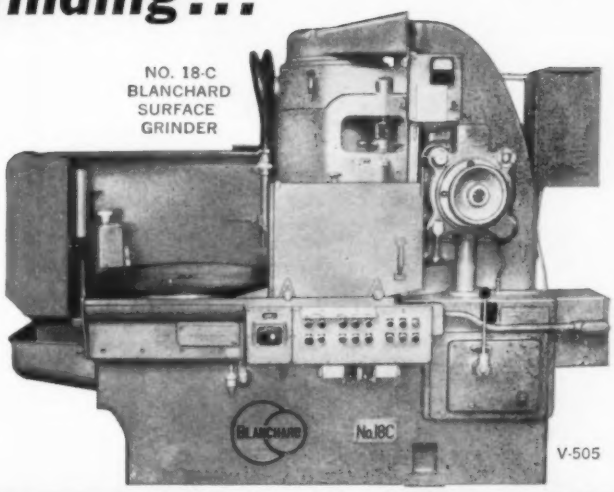
•

INDUSTRIAL COMPRESSORS FOR TOMORROW. *Produced by Carrier Corp, Syracuse, NY. 16 mm, sound, color. No charge.*

Steps in the manufacture of an axial-flow compressor, from raw material to finished product, are a feature of this new film. Also demonstrated is the mechanical principle of blades rotating at close tolerance between stationary blades to move gases in tremendous volume and under pressure.

For better, easier grinding...

Whether you're "hogging" off stock from rough castings or precision grinding to a tolerance of ±.0005", you can do it better and easier with the Blanchard No. 18-C Surface Grinder. Once the work is set up, the automatic cycle handles every operation from start to finish. The operator is free to prepare the next load of work or to operate a second No. 18-C Grinder.



Cast Iron Plate. Blanchard ground at the rate of 30 pieces – 60 surfaces – per hour. Stock removal ⅛" each side.

Steel Bars. Blanchard ground at the rate of 48 pieces – 192 surfaces – per hour. Stock .040"-.045" from each side. Limits ±.001" square, flat and parallel.

Hot Rolled Steel Cams. One operator and one No. 18-C Blanchard produce 225 pieces – 450 surfaces – per hour. Stock removal 1/32" each side. Limits ±.001".

just push a button...

- Automatic size control to ±.0005"
- Duplication of repetitive loads
- Pre-set "spark out" time for flatness and surface finish
- No more "operator worry" on close work – greatly reduced fatigue
- A large part of operator's time available for
  - (a) Handling or slushing work pieces
  - (b) Filing burrs
  - (c) Selecting correct wheel and preparing for next job
- Specially-designed sizing device with built-in feature to compensate – automatically – for wheel wear during grinding cycle.

All of these features give you *more efficiency at reduced costs!*

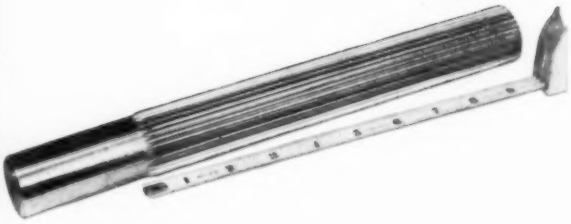
PUT IT ON THE BLANCHARD

Send for your free copy of Model 18-C folder.

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

Tubular parts—*On even thin-walled tubes from ½ to 2-inches OD, splines and serrations can now be quickly and inexpensively Roto-Flo cold formed.*



Long splines—*can now be cold rolled on solid as well as tubular parts. 30° or 45° PA tooth forms can be made with this low-pressure method and axially fed parts.*

Announcing a NEW ROTO-FLO METHOD

Now the **ROTO-FLO** chipless process that cold forms toothed parts faster at lower cost is extended to a broader range of parts. The development complements present Roto-Flo equipment.
Write for details!

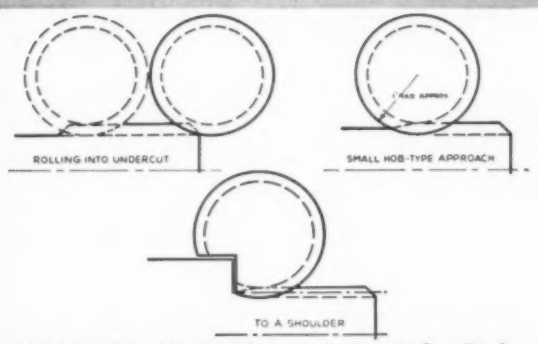
–for spline rolling tubular parts

–for splines of any length

–with versatile lower cost tooling

–economical for shorter runs

Lower-cost tooling—*Cylindrical forming racks reciprocate in opposed directions while a part is fed in axially. Racks are indexable to several settings for long life and lower tool inventories. No regrind costs are involved with these throwaway forming inserts.*



All kinds of parts—*are inexpensively splined or serrated with this versatile new Roto-Flo method. Notched racks can form full-depth teeth within ¼ inch of a shoulder. Parts having the same diametral pitch can be rolled with the same rack.*

May we have the Roto-Flo field engineer in your area show you how this new method can make your parts better.

MICHIGAN TOOL Company

7171 E. McNICHOLS RD., DETROIT 12, MICH., U.S.A.
IN CANADA: COLONIAL TOOL CO. LTD.

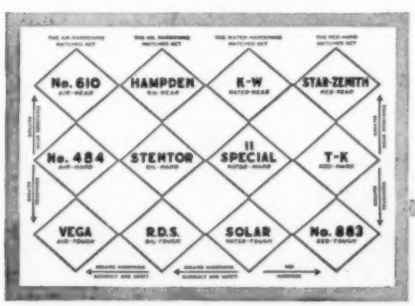
Ten years on the same job has given this heat treater plenty of experience comparing oil-hardening tool and die steels.

As an example of why he rates STENTOR so high, take the dies that just came out of the furnace. They'll be used to form 2½" split ring connectors from SAE or AISI 1010 hot rolled steel.

And they're going to be used "as is" . . . with no grinding or adjusting. STENTOR's freedom from distortion and dimensional change is the answer.

But now Dan is in for the real surprise. STENTOR now has a "built-in" factor of safety. Its broader hardening range of 1425° F to 1525° F makes it the easiest oil-hardening steel to heat treat. It requires no preheat. It offers freedom from decarburization. And machinability is excellent.

If you haven't tried Carpenter STENTOR with its new broader hardening range—do it today. You'll save time and money . . . free yourself of many worries. Your nearby Carpenter SERVICE-CENTER has complete stocks for fast service.



® U. S. Patent Office, The Carpenter Steel Co., Reading, Pa.

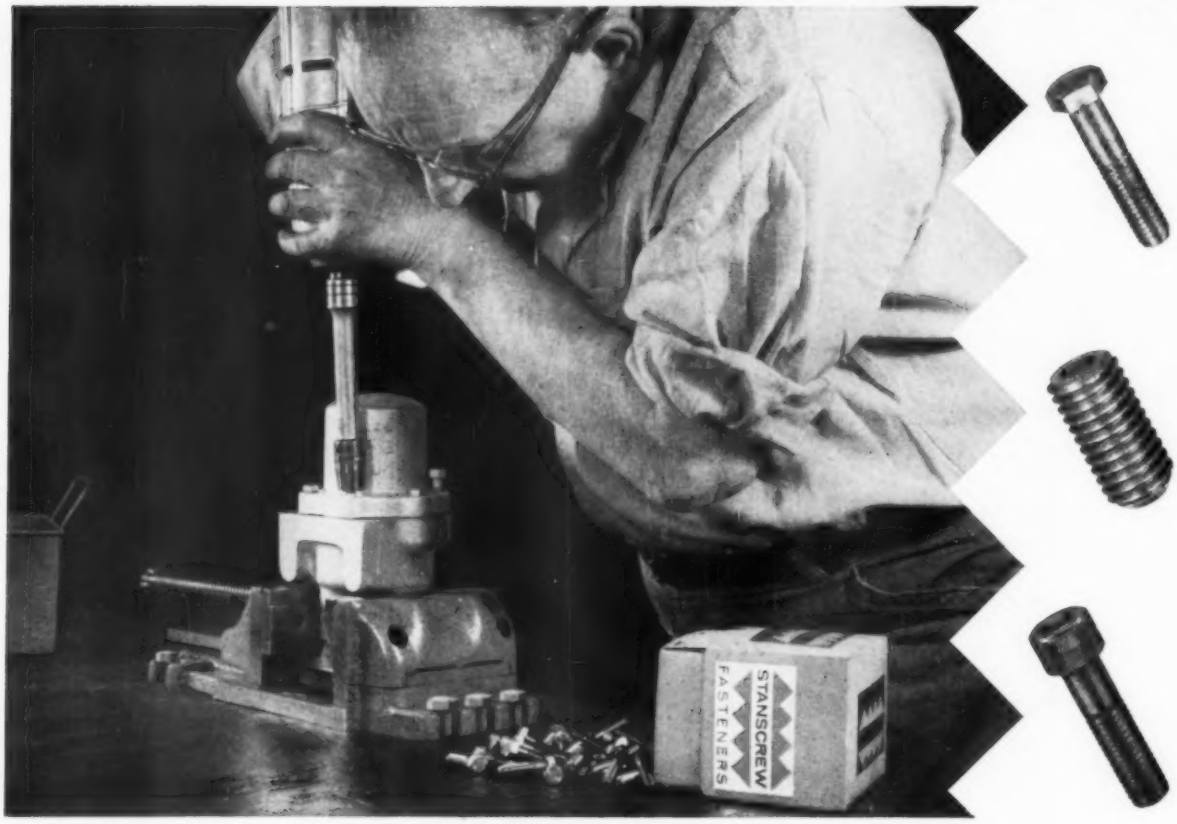
Carpenter STEEL

Matched Tool and Die Steels

The Carpenter Steel Co., 109 W. Bern St., Reading, Pa.

Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

IT PAYS TO STANDARDIZE ON **STANSCREW**



Stanscrew service cuts rejects, speeds assembly for valve manufacturer

A prominent manufacturer of 4-way valves for freon was having trouble on his assembly line. His fasteners, tightened to an extreme degree to prevent seepage of the gas, were breaking on too many occasions. This meant complications in assembly and a high reject rate—which increased production costs substantially.

One of Stanscrew's fastener specialists, called in by a Stanscrew distributor, quickly found the answer. He recommended a standard cap screw and had staff engineers work out the precise torque which should be applied to insure a complete seal at all gaskets, yet eliminate any possibility of fastener breakage. By following these recommendations, the manufacturer has eliminated the problem of fastener breakage, and substantially reduced his reject rate.

Stanscrew offers over 4,000 standard fasteners . . . including a complete selection of socket, set, and cap screws. All are produced under rigid quality control methods and incorporate the lessons learned during 85 years of fastener manufacture. All 4,000 are always in stock and quickly available.

For the answer to your fastener problem, call your Stanscrew distributor. He will have a Stanscrew fastener specialist promptly study your operation and make specific recommendations.

STANSCREW FASTENERS

CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS
HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT
WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

IMMUNOL

Reg. U.S. Pat. Off.

can be used to improve 22 metalworking operations!

Use IMMUNOL, the neutral, non-toxic, non-flammable, odorless solvent to improve your metalworking operations. This widely used product eliminates the fire hazard, is inexpensive and odorless. It is available in several grades to be mixed with water for:

Rustproofing
to protect cast iron and other ferrous metals against rust for long or short periods of time.

Cleaning
to quickly clean oil, grease, soil and dirt from any metal surface from small parts to heavy machinery.

Cleaning and Rustproofing
to leave a protective rustproof surface as it cleans, so minute it cannot be seen or felt.

Magnetic Inspection
to replace kerosene or mineral spirits and safely reduce costs, speed production, improve definition.

Adding to Soluble Oils
a 1:50 mixture gives cooler work, better tool life, better finishes, additional rust protection.

Buffing
to insure swift and complete removal in cleaning.

Plating
to remove all surface residues in preparation for plating and as an additive to final rinses.

Honing
to aid in heat convection and release stone dust.

Cutting
to increase penetration, lower surface tension, insure cooler work, better finishes.

Grinding
to increase heat convection of coolant, wet out metallic silt and wheel dust.

Tumbling
to shorten the cycle, insure cleaner, rustproofed work.

Degreasing
to reduce costs, improve results, eliminate dermatitis and other hazards.

Solvent Replacement
to remove cutting oils from machined parts, at lower costs, without hazards.

Hydrostatic Testing
to give water clear, rustproof solutions.

Quenching
to prevent rusting of tank and metals quenched.

Rustproofing Internal Systems
one part to 2500 parts plain water, prevents rusting.

Dispersing Silt
to facilitate cutting and grinding operations by dispersing and sinking metallic silt particles.

Heat Convection
to increase the convection property of plain water used for cooling, frictional heat or quenching.

Lowering Surface Tension
to insure faster penetration of liquids.

Emulsifying Fats
to carry them off and clean the receptacle.

Sealing Aluminum
after anodizing to produce a mirror-like finish, seal the pores of the metal and make it more resistant to contamination.

Replacing Vapor Degreasing
to clean better, rustproof the metal, eliminate odors, skin irritations, the dangers of fire.

Write for this free booklet. It describes in detail the many outstanding results users have obtained with IMMUNOL.

HARRY MILLER CORP. HAMICO 4th & BRISTOL STREETS PHILADELPHIA 40, PA.

Manufacturers of
HAMIKLEER, ACTIVOL, HAMICOTE,
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HARRY MILLER CORP.
Original Products and Processes Since 1936
4th and BRISTOL STS., PHILA. 40, PA.
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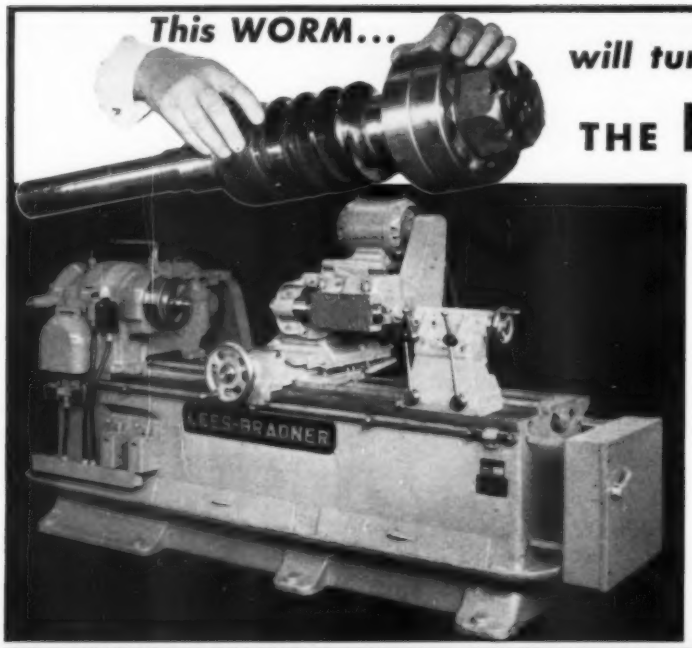
This WORM...



will turn better... thanks to...

THE LEES-BRADNER HT

Building precision into other machine tools is a unique feature of The Lees-Bradner Model HT Thread Milling Machine.

The worm illustrated above was produced by the Cleveland Worm and Gear Co. in one hour 23 minutes at a cutter spindle speed of 61 R. P. M. The pitch diameter of the worm was 3.728" with an outside diameter of 4.625".

Contact Lees-Bradner for complete information on fast, precision threading with the Model HT Universal Thread Milling Machine.

Details on Worm Gear Production

Hob Spindle Speed	61 R. P. M.
Circular Pitch	1.420"
Pitch Diameter	3.728"
Outside Diameter	4.625"
Threading Time	1 hour 23 min.
Material	2315 Steel
Weight of Worm	51.76 lbs.

the LEES-BRADNER Company

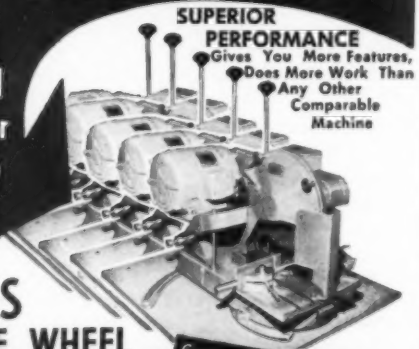
CLEVELAND 11, OHIO • U.S.A.

CIRCLE 294 READER SERVICE CARD

LOW COST

priced so low you can afford several for your shop

SUPERIOR PERFORMANCE
Gives You More Features, Does More Work Than Any Other Comparable Machine



The NEW BACKUS ABRASIVE WHEEL CUT OFF SAW

For Ferrous Metals

HERE'S WHAT THIS SENSATIONAL MACHINE CAN DO IN YOUR SHOP . . .

- Cuts 1⅛" bars, 2" tubing, 1½" pipe, 2" x 2" x ¼" angles
- Protects for overload and low voltage
- Has Quick action vise
- PLUS special engineered leverage for maximum sensitive "feel"
- Eliminates costly breakdowns
- Prevents high maintenance

Converts Easily For Cutting of Non-Ferrous Materials Also! This abrasive saw is already machined to accommodate the Backus Multi-Purpose Saw Unit. With this conversion unit, the saw may be used for cutting both ferrous and non-ferrous metals!

Also Available . . . BACKUS NON-FERROUS CUT OFF SAW For Aluminum and Aluminum Extrusions, Plastics, Brass, Slats and Roll-Up Awnings

BACKUS machine works SINCE 1914.

532 ROUTE 17 CARLSTADT, NEW JERSEY

CIRCLE 309 READER SERVICE CARD

BEVEL GEARS AND BEVEL PINIONS WITH LONG STEMS

ALL TYPE GEARS

BILGRAM GEAR & MACHINE WORKS

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low cost HYDRAULIC KEYSEATER

cuts standard, tapered keyways ¼" to 2" wide

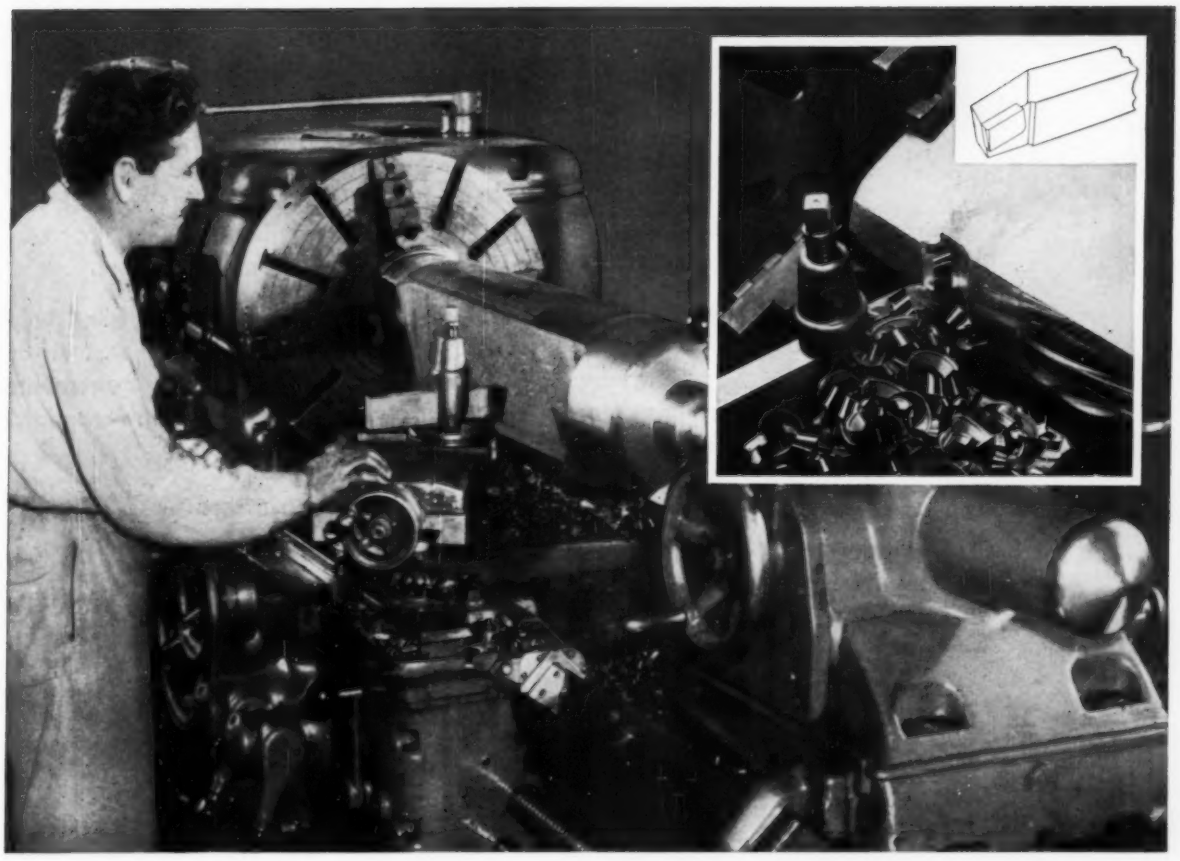
- fast set-up—saves time and money
- low cost operation-uses standard tool bits
- heavy-duty hydraulic circuit—assures accurate keyways
- compact, 21" x 61"—no special foundation

Send for Bulletin 34

E. W. BLISS COMPANY

1132 N. Seventh St., San Jose, Calif.

CIRCLE 296 READER SERVICE CARD



Kennametal Style BL-24 Brazed Tool, modified, being used on its side as a shear angle tool on interrupted cut. Run at 207 SFM and .033" feed per revolution, this tool completes shanks four times faster than the HSS forged tools previously used.

Here's why...

KENNAMETAL* still makes brazed tools

Rapid acceptance of the Kendex* principle of throw-away insert tooling, makes it appear at times that brazed tools are "on their way out." Not by a long shot! On many short runs and on many jobs where modified tools are needed, such as illustrated, Kennametal Brazed Tools are often the best choice for tool performance and economy.

Consider the unusual job shown above, for example . . . turning rough, scaly SAE 4140 steel forgings. The 53" long workpiece has two parallel flats about 8¼" wide and 45" long. From a 12" rough-forged diameter it must be turned down to 4½" on the chuck end. When finish machined, the piece serves as the shank for a 300-ton capacity hook used in handling oil well drill pipe string. Depth of cut from ⅜" to ⅞", including about ½" of scale, plus the severe interrupted cutting for the flats, makes this a tough operation for **any** tool.

To do the job, a standard Kennametal BL-24 Brazed Tool was slightly modified into a shear angle tool to take the interrupted cut without difficulty.

Whether you need tools for production or short runs; indexable "throw-away" insert or brazed-type tooling; standard or modified blanks; precision or utility "throw-aways"... Kennametal has thousands of items in stock to provide the right tool and grade for every machining job.

To be sure you get the most productive and economical tooling, call on your Kennametal Representative to help get Top Tooling on all your machining operations. Or write KENNAMETAL INC., Dept. FB, Latrobe, Pennsylvania, for complete information about a Top Tooling Program fitted to your needs.

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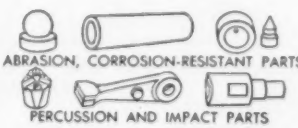
INDUSTRY AND
KENNAMETAL
...Partners in Progress



THE NATION'S STANDARD FOR ACCURACY

Freeland Standard AIR GAGES

• Pioneers in the air gaging field and the largest producer of AIR GAGE MEMBERS FOR ALL CIRCUITS, the Freeland organization offers a combination of high quality, low cost and fast delivery on all types of air gage members.

• In chrome, steel or carbide . . . through hole, blind hole or special . . . flow, differential or back pressure . . . all of these are available at Freeland. Whatever your requirements in air gaging, specify FREELAND! Order the nation's standard for accuracy now!

FREELAND RECONDITIONING SERVICE FOR ALL AIR GAGE MEMBERS

Whatever the type or condition, Freeland craftsmen can renew that air gage member. Let us show you . . . Send it in!

VALUABLE REFERENCE GUIDE AVAILABLE
The Freeland GENERAL REFERENCE AND ORDER GUIDE—Air Gage Members For All Circuits, can be yours without obligation. Write today.

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Precision gaging • *Precision Tooling* • *Precision Production*
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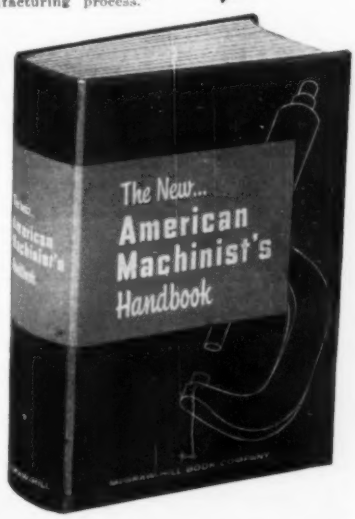

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7/28/58

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(This space contributed as a public service by this magazine.)

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LITTELL

FEEDING-STRAIGHTENING MACHINES

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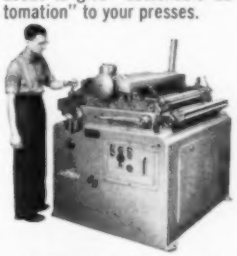

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District Offices: Detroit, Cleveland

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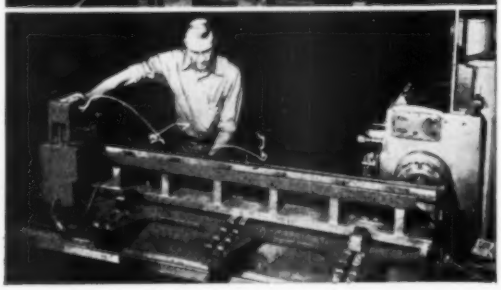
MAJOR TIME SAVINGS

...result from shift to magnetic clamping



Wrist lights tell the story in these two photos. The job is the same—only the clamping method changes. Note how the excessive motion required with mechanical clamping (top view) is eliminated with the change to Sundstrand magnetic clamping (lower view).

Longer tool life, greater clamping uniformity, and a significant reduction in operator fatigue are a few of the outstanding benefits you are sure to get with magnetic clamping. A quick check on its application to your jobs will show you others.

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SUNDSTRAND

POWER-GRIP

SUNDSTRAND MACHINE TOOL CO.

Magnetic Products Division

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CIRCLE 302 READER SERVICE CARD

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A Precision Tool — Compact — Simple To Operate

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Table Size: 7" x 17½"; Table Travel: 6½" x 10".

IT WILL PAY YOU TO INQUIRE — WRITE NOW!

LINLEY BROTHERS CO.

664 STATE ST. EXT. • BRIDGEPORT 1, CONN.

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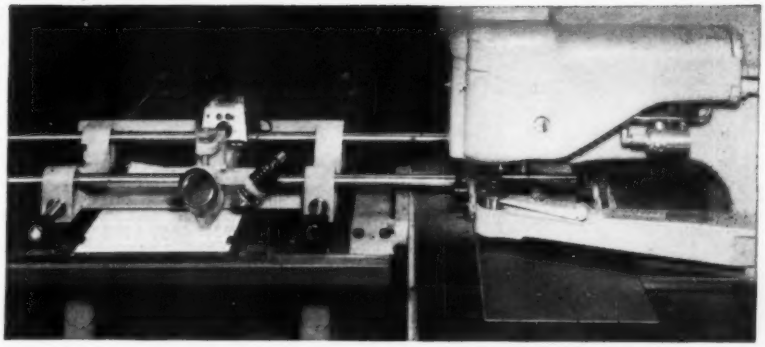

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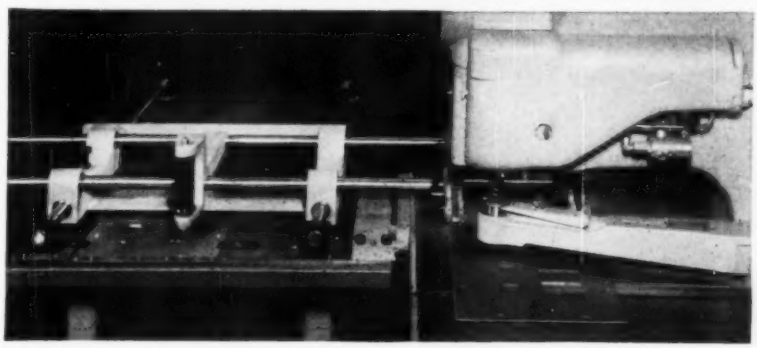

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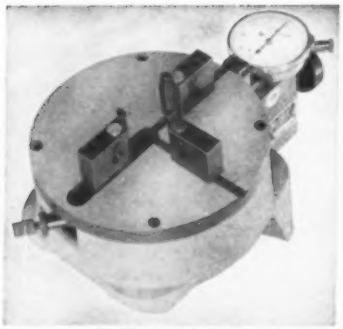

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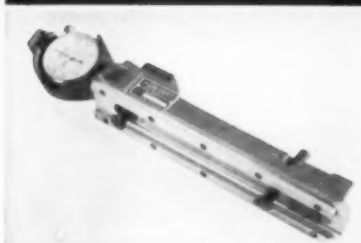

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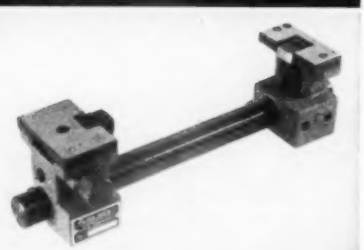

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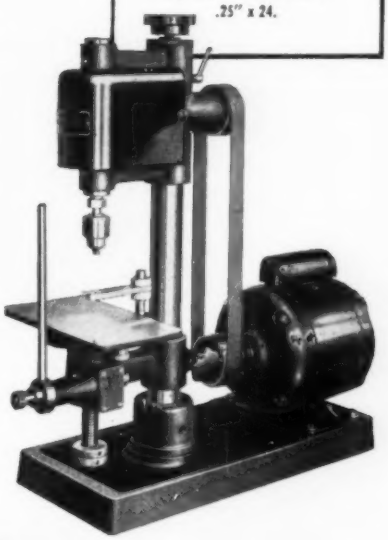

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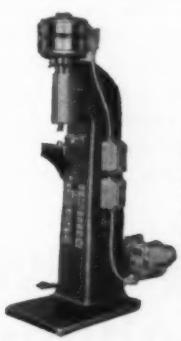

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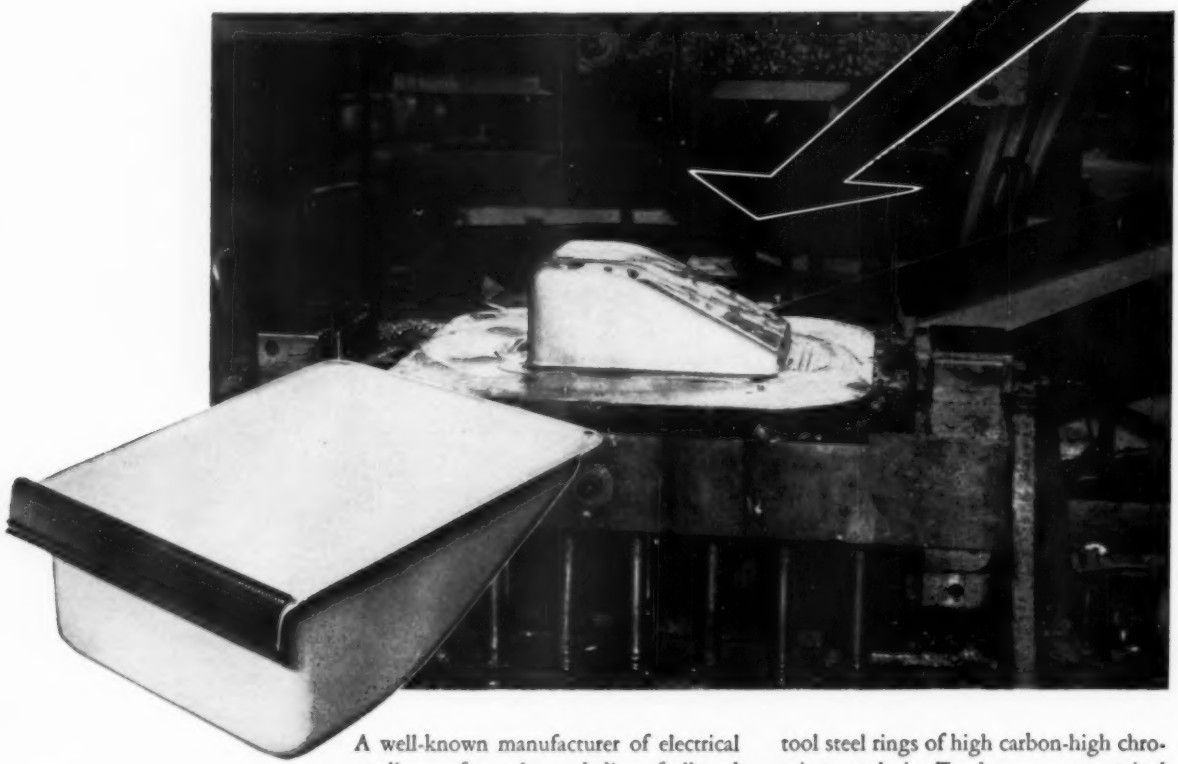

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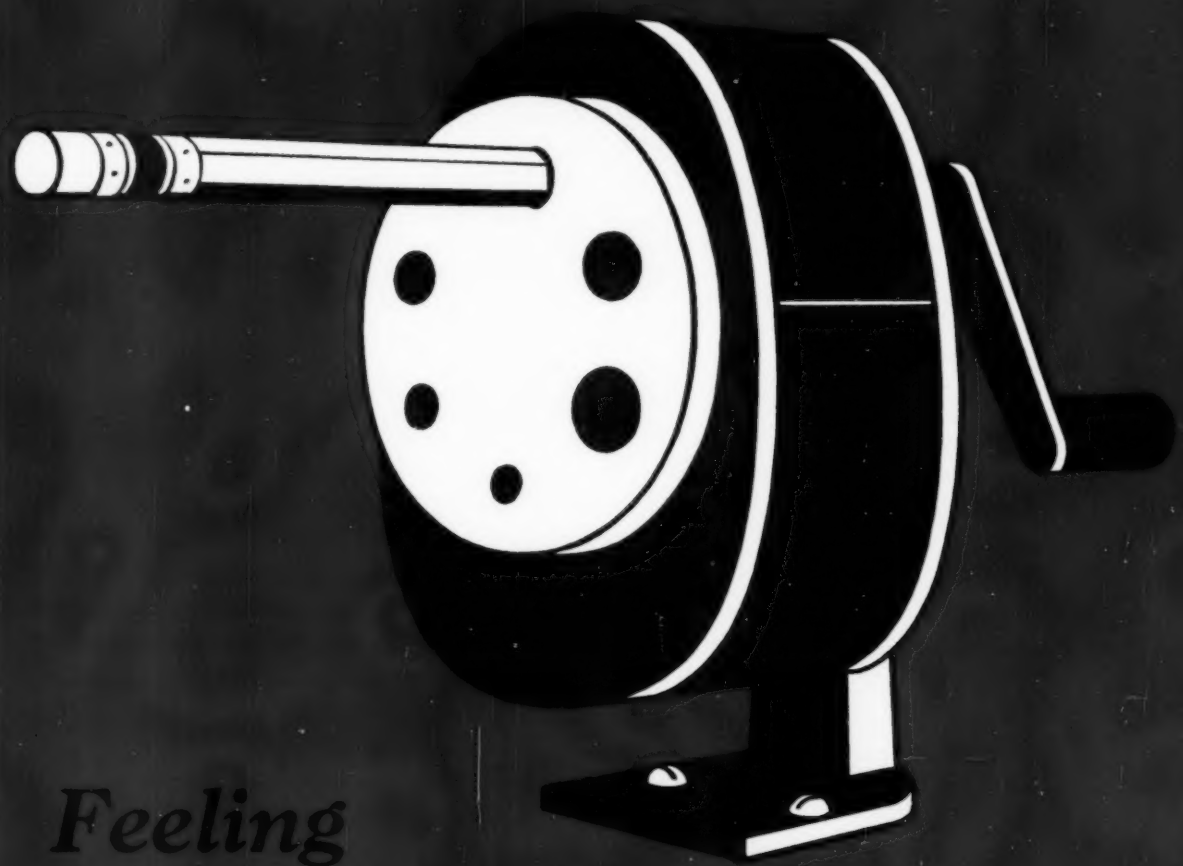

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